

Chapter 7

Landscaping Design Standards and Policies Revised December 1999

Chapter 7, Landscaping, describes the City's median design standards and outlines the design standards for the City's streetscapes. This chapter also addresses the planning, design, maintenance and construction of non-paved trails within the City of Scottsdale. Additionally, Chapter 7 contains guidelines to assist individuals and companies in compiling the necessary data required to submit for a native plant permit in accordance with Article 5, Chapter 46 of the Scottsdale Revised Code. This chapter also presents standards and policies to serve as a guide during the design phase of Park and Recreation facilities.

Section 7.1

Median Landscape Design Standards and Policies Revised December 1999

Chapter 7 Landscaping

SECTION 7.1

MEDIAN LANDSCAPING

PAGE INDEX

| SECTION | PARAGRAPH TITLE | PAGE |
|---------|-------------------------------------|------|
| 7-101 | Purpose | 1 |
| 7-102 | Median Character | 1 |
| | A. Downtown & Urban Character | |
| | B. Suburban Character | |
| | C. Transitional Arid Character | |
| | D. Natural Character | |
| 7-103 | Landscape Guidelines | 2 |
| | A. Maintenance Responsibility | |
| | B. Median Widths | |
| | C. Ends of a Median | |
| | D. Placement of Trees & Shrubs | |
| | E. Tree Quantities & Sizes | |
| | F. Grading | |
| | G. Decomposed Granite | |
| | H. Boulders | |
| | I. Plant Selection | |
| 7-104 | Irrigation Guidelines | 3 |
| | A. Workmanship and Materials | |
| | B. Approved Irrigation System Types | |
| | C. Controllers | |
| | D. Power Source | |
| | E. Water Source | |
| | F. Remote Control Electric Valves | |
| | G. Back Flow Prevention Devices | |
| | H. Approved Ball Valves | |
| | I. Approved Emitters | |
| | J. Approved Bubblers | |
| | K. Approved Pressure Regulators | |
| | L. Pipe | |
| | M. General Irrigation Notes | |
| | N. Final Plan Submittal | |
| 7-105 | Sight Distance | 6 |
| | A. Sight Distance & Safety Triangle | |

B. Planting within Safety Triangle

| | | |
|-------|-------------------------|---|
| 7-106 | Alterations & As-Builts | 7 |
| 7-107 | Non-Conformance | 7 |

FIGURE LIST

| FIGURE | DESCRIPTION |
|--------|--|
| 7.1-1 | List of Recommended Plants |
| 7.1-2 | Planting Details for Saguaros |
| 7.1-3 | Saguaro Relocation Procedures |
| 7.1-4 | Security Enclosure for Backflow Prevention Devices |
| 7.1-5 | Irrigation Specifications |
| 7.1-6 | Landscape Specifications |



SECTION 7.1 MEDIAN LANDSCAPING

7-101 PURPOSE

This section describes the City's Median Design Standards. It is intended to acquaint designers and developers with these standards; as well as to assist them in processing plans through the plan review process in an efficient and timely manner.

7-102 MEDIAN CHARACTER

There are four character areas with differing median design standards for each area. These are general designations. Contact the City of Scottsdale's Development Quality / Compliance Division office at (480) 312-7080 to determine which character area designation to use for each specific project.

Medians within Commercial Cores as identified in the General Plan will be allowed a higher percentage of plant coverage with the plant materials for the character area in which they are located.

A. Downtown and Urban Character

1. Balance the use of plant material with decorative paving (stamped concrete, exposed aggregate, pavers, etc.), to minimize the exposure of decomposed granite.
2. Landscaping of medians in the Downtown couplet system is to conform to specifications in the Downtown Infrastructure and Master Street Plan.
3. Plant palette and quantities shall conform to the Downtown Urban Design and Architectural Guidelines, Appendix A.

B. Suburban Character

1. Use decomposed granite, exposed aggregate, and grouted riprap in place of decorative paving.

2. Plant palette should begin to incorporate more arid-type materials (see Figure 7.1-1 of this Manual).

C. Transitional Arid Character

1. Handset riprap and decomposed granite are to be the primary inorganic materials.
2. Plant palette shall consist of indigenous and desert-compatible materials (see Figure 7.1-1).

D. Natural Character

1. Native stone and indigenous decomposed granite are to be the primary inorganic materials.
2. Plant palette is to consist of indigenous materials only, and shall conform to the native distribution patterns, densities, and maturity.

7-103 LANDSCAPE GUIDELINES – See Figure 7.1-6 of this Manual

A. Maintenance Responsibility

1. Maintenance of landscape medians will be the responsibility of the developer, property owner, or a homeowners association for a given period of time (usually 3 years). This period of responsibility will begin and end following inspections and acceptance of installation by a representative of the City's Planning Inspection unit. It is the developer's responsibility to set up the inspections by calling Inspection Services at (480) 312-5750.
2. The particulars for maintenance responsibility of medians are to be stated on the final landscape plans submittal, the final plat, and/or in a separate agreement with the city.

B. Median Widths

1. More detailed information is contained in the City of Scottsdale Design Standards and Policies Manual, Section 3.1 Geometrics, subsection 3-102.C. and Figures 3.1-2, 3.1-3, 3.1-4, and 3.1-8.
2. Median width is measured from back of median curb to back of median curb. The minimum width for a median is 3 feet. If the median is landscaped, a 4 foot minimum is generally required. Within the City's Hillside Area, 8 feet is the minimum requirement.

C. Ends of a Median

The first ten (10) feet and the last ten (10) feet of a median are to be decorative concrete (stamped concrete, exposed aggregate, etc. – be creative).

D. Placement of Trees and Shrubs

1. For planting details of trees, shrubs, and groundcovers see (City of Scottsdale Supplemental Standard Details for Public Work Construction" – Detail #2620. For saguaro planting details, see Figure 7.1-2 of this section.

2. Trees shall be located a minimum of five (5) feet from the back of median curb. Mature canopy size shall also be considered and may require a greater setback.

E. Tree Quantities and Sizes

Trees shall be provided at the rate of one tree per each thirty-five (35) lineal feet of median length. The minimum size is 15 gallon with fifty (50) percent to be provided as mature trees (as defined in Article III of the Zoning Ordinance) or larger.

F. Grading

1. Mounding should not be used in the area designated as Downtown or as Urban Character.
2. The maximum slope of any mounding shall be 4:1 (25%).
3. The finished grade shall be smooth, uniform, and a minimum of four (4) inches below the top of curb.

G. Decomposed Granite

1. Size is to be one half (1/2) inch minus.
2. For installation see (City of Scottsdale Supplemental Standard Details for Public Works Construction" – Detail #2620.
3. A sample shall be submitted to Inspection Services for approval prior to the contractor ordering and bringing onto the site.
4. Color to match what exists in the area. If none exists in the area contact a representative of the city's Planning Inspection unit at (480) 312-5750 to determine an acceptable color.

H. Boulders

1. One-third of any boulder is to be set in ground.
2. Maximum vertical exposure is eighteen (18) inches above grade.

I. Plant Selection

All plant materials used in a median are required to come from the Arizona Department of Water Resources low water use plant list for the Phoenix Active Management Area. See Figure 7.1-1 of this section. The selected plant materials are also to be consistent with the appropriate character areas described in Section 7-102 of this manual.

7-104 IRRIGATION GUIDELINES – See Figure 7.1-5 of the Manual

A. Workmanship and Materials

All materials and workmanship shall conform to the requirements and recommendations of the Irrigation Association Standards. All material specifications shall be based on ASTM standards. All work standards shall be in compliance with ANSI.

B. Approved Irrigation System Types

1. Drip system using rigid laterals.
2. Bubbler system using pressure-compensating bubblers. (Use only with written approval from City of Scottsdale Field Services.)

C. Controllers

1. Rainbird RCM-B (or approved equivalent) controllers are to be used. Contact a representative of the City's Planning Inspection unit at (480) 312-5750 for any substitution.
2. A security cabinet is to be provided for each controller. See "City of Scottsdale Supplemental Details for Public Works Construction" – Details #2630-1, -2, and – 3.
3. Controllers are to be grounded. Show details on final irrigation plans.
4. Calculations for precipitation rate of each station are to be provided on the blue prints.
5. Station area coverage maps, sealed in plastic, are to be provided on each controller. This may be a reduced copy of the plans.
6. Controllers are to be placed in the center of the median a minimum of twenty (20) feet before the beginning of the turn bay.

D. Power Source

1. Contractor is responsible for initiating account and service connection.
2. Power source is to be located within the median or the right-of-way, or a utility easement must be provided. This location is to be indicated and noted on the final irrigation plans.
3. A power cut-off switch is to be provided to each controller.
4. All wiring (110 and 24 volt) is to be sleeved under pavement, sidewalks, etc.

E. Water Source

1. Water source and location of proposed tap is to be shown on final irrigation plans.
2. Contact C.O.S. Water and Wastewater at (480) 312-5650 for information on tapping into city waterlines.

3. The minimum source pressure required to operate the system shall be noted on plans.

F. Remote Control Electric Valves

1. Valves are to be of brass construction minimum size one (1) inch.
2. Approved valve is Rainbird series G.
3. Ball valves shall be installed in front of all control valves.
4. All direct buried control valve wiring shall be a minimum 14 gauge.

G. Back Flow Prevention Devices

1. Only reduced pressure assemblies will be used.
2. Acceptable back flow prevention devices are Febco 825-Y or Watts 909 assemblies with ball valve shut off. See "City of Scottsdale Supplemental Standard Details for Public works Construction" – Detail #2354.
3. All back flow prevention devices shall have a security enclosure. See Figure 7.1-4.
4. Union to be installed on back flow assembly.
5. Brass wye strainer shall be installed on back flow assembly.
6. Back flow prevention devices must be tested by a certified tester before the city accepts responsibility for maintenance of the system. Contact (480) 312-5650 for a list of approved certified testers.

H. Approved Ball Valves

Ball valves shall be manufactured by Febco or Watts. Approved equivalents may be substituted. Contact a representative of the City's Planning Inspection unit at (480) 312-5750 for substitute approval.

I. Approved Emitters

1. Bow Smith "SL" and "ML200" series or approved equivalent (for trees only). See "City of Scottsdale Supplemental Standard Details for Public Works Construction" – Detail #2641.

J. Approved Bubblers

1. Rainbird pressure compensating bubblers or approved equivalent.

K. Approved Pressure Regulators

1. Senninger preset pressure regulators or approved equivalent.

L. Pipe

1. All pipe shall be minimum Class 200 PVC.
2. All main lines, sleeves, and fittings shall be minimum Schedule 40 PVC.
3. Copper, or brass, shall be used between water meter and backflow prevention device. See "City of Scottsdale Supplemental Standard Details for Public Works Construction" – Detail #2355.
4. All risers shall be flexible vinyl PVC pipe. See "City of Scottsdale Supplemental Standard Details for Public Works Construction" – Detail #2641.
5. Compression couplings shall not be allowed on main lines.

M. General Irrigation Design Criteria

1. Main lines are to have a minimum backfill cover of eighteen (18) inches.
2. Lateral lines are to have a minimum backfill cover of twelve (12) inches.
3. Schedule 40 sleeving under roadways are to have a minimum horizontal separation of four (4) inches and a minimum backfill cover of twenty-four (24) inches.
4. Piping located in the same trench are to have a minimum horizontal separation of four (4) inches.
5. The irrigation system is to be located entirely within the median.
6. Valve boxes are to have a six (6) inch minimum pea gravel sump.
7. All solvent welded PVC pipe and joints are to be primed with pipe primer. The type of glue and primer shall be per the pipe manufacturer's recommendations or directions.
8. Back fill material is to be free of rocks, boulders, and any other extraneous matter and debris.
9. Contractor is responsible for initiating account and having water meter set.
10. Trees and shrubs shall be valved separately.
11. The entire irrigation system must be independent of other users, i.e. landscape dedicated to the City of Scottsdale for maintenance is to have separate power and water meters from other irrigation systems.
12. All back fill material for trenches shall be free of rock and debris.
13. Plans shall indicate existing and design operating water pressure requirements.

N. Final Plan Submittal

Final submittal for irrigation plans shall show details for controller valves, pressure regulator, backflow prevention device, valve boxes, enclosures, flush caps, trenching, backfill, security cabinet, emitters, and/or bubblers.

7-105 SIGHT DISTANCE

A. Sight Distances & Safety Triangle

1. To determine sight distances, use the criteria set forth in Section 3.1, Geometrics, subsection 3-102.J.3., of the City of Scottsdale's "Design Standards and Policies Manual".
2. The sight line as shown in Chapter 3.1, figure 3.1-13, shall be clearly indicated and delineated on the final landscape plan submittal.

B. Planting within the sight triangle

1. Shrubs planted within the sight triangle are to have a mature height of not more than two (2) feet. Height shall be from edge of pavement, and total height shall include the height of any mounding.
2. Trees planted within the safety triangle are to have a canopy pruned to a height of seven (7) feet or greater upon installation. Height shall be from edge of pavement, and total height shall include the height of any mounding.

- C. Any plant material installed in a questionable area (ie: safety triangles, sight lines) will be identified by traffic engineering and removed by the contractor.

7-106 ALTERATIONS AND AS-BUILTS

If field conditions require relocation of water meter, backflow prevention device, controller, valve, or any other major component of the irrigation system as shown on approved plans contact a representative of the City's Planning Inspection unit at (480) 312-5750 prior to any installation.

Contractor is to provide an accurate set of as-built mylar drawings to the Landscape Inspector prior to initial acceptance of a system.

7-107 NON CONFORMANCE

Designs which do not conform to the criteria set forth in this publication may be appealed in writing to the Development Review Board. The approval, with or without conditions, or denial by the Development Review Board of an application shall be final unless within twenty (20) days from the date of the board's decision the applicant shall appeal therefrom in writing to the City Council. Such appeal shall be submitted through the City Clerk and shall indicate where, in the opinion of the appellant, the Board was in error. The City Clerk shall schedule the appeal for a City Council agenda, and the City Council at its meeting, shall uphold, modify, or overrule the decision of the Board. The decision of the City Council shall be final.

FIGURE 7.1-1

List of Recommended Plants

A. SUBURBAN CHARACTER AREA

| <u>BOTANICAL NAME</u> | <u>COMMON NAME</u> |
|---------------------------|-----------------------|
| <u>TREES</u> | |
| Acacia abyssinica | Abyssinian Acacia |
| Bauhinia congesta | Anacahuita |
| Dalbergia sissoo | Sissoo |
| Eucalyptus citiodora | Lemon Scented Gum |
| Eucalyptus erythrocorys | Red Cap Gum |
| Eucalyptus torquata | Coral Gum |
| Fraxinus uhdei | Shamel Ash |
| Geijera parviflora | Australian Willow |
| Pithecellobium flexicaule | Texas Ebony |
| Ulmus parvifolia | Evergreen Elm |
| <u>SHRUBS</u> | |
| Caesalpinia spp. | Bird of Paradise |
| Calliandra californica | Baja Fairy Duster |
| Dalea spp. | Daleas |
| Dasyllirion spp. | |
| Leucophyllum spp. | Rangers/Sages |
| Ruellia peninsularis | Desert Ruellia |
| Sophora secundiflora | Texas Mountain Laurel |
| Yucca spp. | |

B. TRANSITIONAL ARID CHARACTER

| | |
|---------------------------|--------------------|
| | <u>TREES</u> |
| Acacia aneura | Mulga |
| Acacia smallii | Sweet Acacia |
| Acacia stenophylla | Shoestring Acacia |
| Cercidium spp. | Palo Verdes |
| Chilopsis linearis | Desert Willow |
| Eucalyptus papuana | Ghost Gum |
| Eucalyptus spathulata | Narrow Leaf Gimlet |
| Eucalyptus woodwardii | Lemon Flowered Gum |
| Pithecellobium flexicaule | Texas Ebony |
| Prosopis spp. | Mesquites |
| <u>SHRUBS</u> | |
| Baccharis 'Centennial' | |
| Calliandra eriophylla | Fairy Duster |
| Cordia parvifolia | Little Leaf Cordia |
| Dalea spp. | Daleas |
| Dasyllirion spp. | |

FIGURE 7.1-1 (*Continued*)
List of Recommended Plants

SHRUBS (*Continued*)

| | |
|----------------------|----------------|
| Hesperaloe spp. | |
| Leucophyllum spp. | Rangers/Sages |
| Nolina spp. | |
| Ruellia peninsularis | Desert Ruellia |
| Salvia clevelandii | Chaparral Sage |
| Yucca spp. | |

Plants other than those listed will be considered on an individual basis.
For recommended plants in the Urban Character Area see the C.O.S. Downtown Guidelines.
For the Native Character Area use indigenous plants only.

FIGURE 7.1-3

Saguaro Relocation Procedures

1. Saguaros shall be replanted on site in a place where they will be safe from present and future construction activities.
2. A rootball of 24" minimum size shall be retained during transplanting, with root length a minimum of 6" on all sides. Dust all wounds and root cuts with soil sulphur.
3. Saguaros must be transplanted with the same north orientation as they originally grew. "NORTH" to be marked on a rib at a height approximately 5'-0" above grade.
4. Saguaros shall be transplanted to the original depth.
5. Saguaros must be watered thoroughly at the time of transplanting to remove air pockets and assure proper soil compaction. Backfill shall be free of injurious rock and debris.
6. Saguaros over 8'-0" in height must have bracing as per Figure 7.1-2 of this manual.
7. Saguaros temporarily planted in a nursery must have individually prepared holes; trench planting is not acceptable.
8. Saguaros 6'-0" and smaller should be relocated to NAOS areas if possible.
9. A watering maintenance program must be submitted for approval prior to planting being started.
10. Any deviations from the above mentioned procedures must have written approval by a representative of the City of Scottsdale's Planning Inspection unit.

FIGURE 7.1-5

IRRIGATION SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes piping, sprinklers, specialties, accessories for extending existing shrubbery irrigation systems.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 2 Section "Water Systems" for water supply.
 - 2. Division 16 Sections for electrical power materials and installations.

1.3 DEFINITIONS

- A. Pipe sizes used in this Section are nominal pipe size (NPS) in inches. Tube sizes are Standard size in inches.
- B. Circuit Piping: Piping downstream from control valves to irrigation system sprinklers, emitters, devices, and drain valves. Piping is under pressure (less than pressure piping) during flow.
- C. Pressure Piping: Piping downstream from supply piping to and including control valves. Piping is under irrigation system pressure. Piping in this category includes pressure regulators, water meters, and backflow preventers, when used.
- D. Control Valve: Manual or automatic (electrically operated) valve for control water flow to irrigation system zone.
- E. Drain Piping: Downstream from circuit piping drain valves. Piping is not under pressure.
- F. Flush Valve: Per dirty water application.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. Location of Sprinklers and Devices: Design location is approximate. Make minor adjustments necessary to avoid plantings and obstructions such as signs and light standards.
- B. Minimum Water Coverage:
 - 1. Turf Areas: 200%, Head to head coverage.
 - 2. Other Planting Areas: 100 percent emitter coverage.
- C. Components and Installation: Capable of producing piping systems with the following minimum working pressure ratings except where indicated otherwise.
 - 0. Circuit and Drain Piping: 125 psig.

1.5 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

1.6 SUBMITTALS

A. Material List

0. Furnish the articles, equipment, materials, or processes specified by name in the drawings and specifications. No substitution will be allowed without prior written approval by the Owner's Representative from Community Maintenance and Recreation.
1. Complete material list shall be submitted prior to performing any work. Material list shall include the manufacturer, model number and description of all materials and equipment to be used.
2. Equipment or materials installed or furnished without Prior approval of the Owner's Representative from Community Maintenance and Recreation may be rejected and the Contractor required to remove such materials from the site at his own expense.
3. Approval of any item, alternate or substitute indicates only that the product or products apparently meet the requirements of the drawings and specifications on the basis of the information or samples submitted.

B. Record Drawings

1. The Contractor shall dimension from two permanent points of reference, building corners, sidewalk or road intersections, etc., the location of the following items:
 - a) connection to existing water lines.
 - b) connection to existing electrical power.
 - c) gate valves.
 - d) routing of sprinkler pressure lines (dimension maximum 100' along routing).
 - e) sprinkler control valves.
 - f) routing of control wiring.
 - g) quick-coupling valves.
 - h) other related equipment as directed by the Owner's Representative.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Handling of PVC Pipe and Fittings: THE CONTRACTOR shall store in covered areas – not exposed to outside elements, and is cautioned to exercise care in handling, loading, unloading, and storing of PVC pipe and fittings. All PVC pipe shall be transported in a vehicle which allows the length of pipe to lie flat so as not to subject it to undue bending or concentrated external load at any point. Any section of pipe that has been dented or damaged will be discarded and, if installed, shall be replaced with piping.

1.8 GUARANTEE

- A. The guarantee for the sprinkler irrigation shall be made in accordance with the form shown below. A copy of the guarantee form shall be included in the operations and maintenance manual. The guarantee form shall be retyped onto the Contractor's letterhead and contain the following information:

GUARANTEE FOR SPRINKLER IRRIGATION SYSTEM

We hereby guarantee that the sprinkler irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and specifications, ordinary wear and tear and unusual abuse or neglect expected. We agree to repair or replace any defects in material or workmanship which may develop during the period of two years from conclusion of maintenance period and also to repair or replace any damage resulting from the repairing or replacing of such defects at no additional cost to the Owner. We shall make such repairs or replacements within 10 working days, as determined by the Owner, after receipt of written notice. In the event of our failure to make such repairs or replacements within specified time after receipt of written notice from the Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand.

PROJECT: _____
LOCATION: _____

SIGNED: _____
Contractor

ADDRESS: _____

PHONE: _____

DATE OF ACCEPTANCE: _____

1.9 QUALITY ASSURANCE

- A. Comply with requirements of utility supplying water for prevention of backflow and backsiphonage.
- B. Comply with requirements of authority with jurisdiction for irrigation systems.
- C. Installer Qualifications: Engage an experienced Installer who has completed irrigation systems similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.
- D. Listing/Approval Stamp, Label, or Other Marking: On equipment, specialties, and accessories made to specified standards.
- E. Listing and Labeling: Equipment, specialties, and accessories that are listed and labeled.
1. The Terms "Listed" and "Labeled": As defined in "National Electrical Code," Article 100.
 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

- F. Product Options: Irrigation system piping, specialties, and accessories are based on specific types, manufacturers, and models indicated. Components with equal performance characteristics produced by other manufacturers may be considered, provided deviations in dimensions, operation, and other characteristics do not change design concept or intended performance as judged by the Owner's Representative in Community Maintenance and Recreation. The burden of proof of product equality is on the Contractor. Refer to Division 1 Section "Product Substitutions."

1.10 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Verify that irrigation system piping may be installed in compliance with original design and referenced standards.
- B. Site Information: Reports on subsurface condition investigations made during design of the Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions (between soil borings). **Owner assumes no responsibility for interpretations or conclusions drawn from this information.**

1.11 SEQUENCING AND SCHEDULING

- A. Maintain uninterrupted water service to building during normal working hours. Arrange for temporary water shutoff with Owner.
- B. Coordinate irrigation systems work with landscape work specified in Division 2 Section "Landscape Work."

1.12 EXTRA MATERIALS

- A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below. Package them with protective covering for storage and label clearly describing contents.
 - 1. Quick Couplers: Furnish one unit of each size installed.
 - 2. Sprinklers: Furnish quantity of units equal to 10 percent of amount of each type installed.
 - 3. Emitters, Drip Tube, and Devices: Furnish quantity of units equal to 10 percent of amount of each type installed.
 - 4. Valve Keys: Furnish one unit of each type key-operated, control valve installed.
 - 5. Quick-Coupler Hose Swivels: Furnish quantity of units equal to 25 percent of amount of each type quick coupler installed.
 - 6. Quick-Coupler Operating Keys: Furnish quantity of units equal to 25 percent of amount of each type quick coupler installed.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Use only new materials of brands and types noted on drawings, specified herein, or approval equals.
- B. PVC Pressure Main Line Pipe and Fittings:
 - 1. Pressure mainline piping 4" and smaller shall be PVC Schedule 40. Above 4" shall be Class 200 (SDR21).

2. Pipe shall be made from NSF approved Type I, Grade I PVC compound confirming to ASTM specification D 2241. Piping 3" and under shall be SDR solvent weld. Piping over 3" shall be gasketed with ductal iron mechanical joints on ells and tees.
3. PVC solvent-weld fittings shall be Schedule 80, 1-2, II-I NSF approved conforming to ASTM test procedure D2467.
4. Solvent cement for PVC solvent-weld pipe and fittings shall be as manufactured by "Oatey" or equal Type 721.
5. Solvent primer for PVC solvent weld pipes and fittings shall be "all purpose primer" (purple) for PVC and PVC pipe and fittings, equal Type P-70.
6. Installation methods of solvent cement and primer for PVC solvent-weld pipe and fittings shall be as prescribed by the manufacturer.
7. All PVC pipe shall bear the following markings:
 - a) manufacturer's name.
 - b) nominal pipe size.
 - c) schedule or class.
 - d) pressure rating in psi.
 - e) National Sanitation Foundation (NSF) approval.
 - f) date of extrusion.
8. All fittings shall bear the manufacturer's name or trademark, material designation, size, applicable IPS schedule and NSF seal of approval.

C. PVC Non-Pressure Lateral Line Piping (Including Emitter Lateral Piping)

1. Non-pressure buried lateral line piping shall be PVC Class 200 solvent-weld joints for sizes 3/4 and larger. Pipe size 1/2" shall be Class 315.
2. Pipe shall be made from NSF approved, Type I, Grade I PVC compound conforming to ASTM resin specification D2241. All pipe shall meet requirements set forth in Federal Specification PS-22-70, with an appropriate standard dimension ratio.
3. Except as noted in paragraphs 1 and 2 of Section 2.1.C, all requirements for non-pressure lateral-line pipe and fittings shall be the same as for solvent-weld pressure mainline pipe and fittings as set forth in Section 2.1.B of these specifications.

D. Brass Pipe and Fittings

1. Where indicated on the drawings, use red brass screwed pipe conforming to Federal Specification #WW-P-351.
2. Fittings shall be red brass conforming to Federal Specification #WW-P-460.

E. Copper Pipe and Fittings (Any pipe exposed to element/above grade)

1. Where indicated on drawings, use copper pipe conforming to all requirements of ASTM B-88 Type K.
2. All copper pipe shall be new, seamless copper pipe designed for underground water service plumbing purposes, etc.

F. Isolation Gate Valves:

1. Gate Valves 3 in. and Larger:
 - a) shall be iron body, rubber encapsulated resilient wedge and shall conform to specification of American Water Works Association Standard C509.
 - b) shall have 2 in. square operating nut with arrow cast in metal indicating direction of opening.
 - c) shall have ends compatible with pipe in which they are being installed.
 - d) shall be similar to those manufactured by Waterous Valve Mfg. Co., or approved equal.

2. Other Isolation Valves (2-1/2" and smaller):

- a) isolation valves 2-1/2" and smaller shall be ball valves.
- b) approved valves will be 2 piece and constructed of forged brass body and end adapter.
- c) ball shall be full port, chrome plated brass
- d) seats and stem packing shall be virgin PTFE
- e) stem shall be brass with adjustable stem packing nut threaded to body to prevent stem leakage if lever is removed
- f) valves shall be rated 60psi WOG and 150psi WSP
- g) valves shall be equal to WATTS FBV-3

G. Quick-Coupling Valves: Quick-coupling valves shall have a brass two-piece body designed for working pressure of 150 psi operable with quick couples. Key size and type shall be 1" or #44.

H. Control Wiring:

- 1. Connections between the automatic controllers and the electric control valves shall be made with direct burial copper wire AWG-UF 600 volt. Pilot wires shall be a different color wire for each automatic controller. Common wires shall be white with a different color stripe for each automatic controller. Install in accordance with valve manufacturer's specifications and wire chart. In no case shall wire size be less than #14.
- 2. Wiring shall occupy the same trench and shall be installed along the same route as pressure supply wherever possible.
- 3. Where more than one wire is placed in a trench, the wiring shall be taped together in bundle at intervals of 10 feet.
- 4. An expansion curl shall be provided within three feet of each wire connection and each change direction of the main line. Expansion curl shall be of sufficient length at each splice connection at each electric control, so that in case of repair, the valve bonnet may be brought to the surface without disconnection of the control wires. Control wires shall be laid loosely in trench without stress or stretching of control wire conductors.
- 5. All splices shall be made with 2-piece Pentite with sealant. Grease filled splices are not allowed.
- 6. Field splices between the automatic controller and electrical control valves will not be allowed without prior approval of the Owner's representative from Community Maintenance and Recreation.
- 7. All control wire under paving or structures shall be sleeved in Schedule 40 PVC Pipe. Size as required or as shown on the drawings. Minimum size shall be 2".
- 8. Sleeve wire and pipe separately during installation.

I. Automatic Controllers:

- 1. The controller(s) shall be housed in lockable, weather-resistant stainless steel Lamax (brand name) cases. The controller(s) shall be UL listed. The controller shall be pedestal or wall mounted. The controller shall be equipped with an internally mounted transformer.
- 2. Final location of automatic controllers shall be approved by the Owner's Representative from Community Maintenance and Recreation.
- 3. The 120-volt electrical power to the automatic controller location is shown on the drawings. The final electrical hookup shall be the responsibility of the irrigation contractor.

Controller manufacturer shall offer local authorized service for all components and electronics of the control equipment and make available an extended warranty package for a two year period covering all parts and labor for annual budgetary purposes.

J. Electric Control Valves:

1. All electric control valves shall be 3 way solenoid contamination resistant valves, as indicated on drawings.
2. All electric control valves shall be compatible with the automatic controllers and unless otherwise specified shall be of the same manufacture.
3. All electric control valves shall have a manual flow adjustment.
4. Provide and install one control valve box for each electric control valve.
5. One valve per main line tap.
6. All electrical control valves shall have approved ball valves (isolation valves) installed immediately upstream of control valve, same size as valve.

K. Control Valve Boxes:

1. Minimum size to be 16" x 12" x 12" outside dimension. Provide for all valves.
2. Provide extensions compatible with boxes as required to insure box rests on continuous soil base/fired brick. Provide valve box with red brick pavers at corner of each portion of the valve box..
3. Boxes shall be Carson T-type top or approved equal.
4. Provide 6" pea gravel sump below valve body.

L. Sprinkler Heads:

1. All sprinkler heads shall be of the same size, type, and deliver the same rate of precipitation with the diameter (or radius) of throw, pressure, and discharge as shown on the plans and/or specified in these special provisions.
2. Riser units shall be fabricated in accordance with the details.
3. Swing joints for all sprinkler heads shall be the same size as the riser opening in the sprinkler body.
4. All sprinkler heads of the same type shall be of the same manufacturer.
5. Pre-fabricated swing joints will not be allowed.

M. Detectable Tape:

1. Detectable tape shall consist of 0.35 mil thick solid foil core encased in a protective plastic jacket that is resistant to alkalis, acids and other destructive elements commonly found in soil. The lamination shall have sufficient strength that the layers cannot be separated by hand. The total composite thickness shall be 4.3 mils minimum. The foil core is to be visible to ensure continuity.
2. Detectable tape shall have a minimum tensile strength of 63 lbs. In the machine direction and 68 lbs. In the transverse direction per three inch strip.
3. A continuous warning message repeated every 16 to 36 inches shall be imprinted on the tape surface. The tape shall be colored: designating the code appropriate to the type of line which the tape is protecting with name brand facing up to indicate location.
4. The tape shall be applied to all pressurized main line – 4" above.

PART 3 - EXECUTION

3.1 INSPECTION

A. Site Conditions:

1. All scaled dimensions are approximate. The Contractor shall check and verify all size dimensions and receive Owner's Representative from Community Maintenance and Recreation approval prior to proceeding with work under this Section.
2. Exercise extreme care in excavating and working near existing utilities. Contractor shall be responsible for damages to utilities which are caused by his operation or neglect. Check existing utilities drawings for existing utility locations.
3. Coordinate installation of sprinkler irrigation materials, including pipe, so there shall be no interference with utilities or other construction or difficulty in planting trees, shrubs, and ground covers.
4. That Contractor shall carefully check all grades to satisfy himself that he may safely proceed before starting work on the sprinkler irrigation system.
5. No irrigation will be installed unless final grade is (+-) 1/10" above final grade as indicated on the drawings.

3.2 PREPARATION

A. Physical Layout:

1. Prior to installation, the Contractor shall stake out all pressure supply lines, routing and location of sprinkler heads.
2. All layout shall be approved by Owner's Representative from Community Maintenance and Recreation prior to installation. Call 480-312-2189.

B. Water Supply:

1. Sprinkler irrigation system shall be connected to water supply points or connection as indicated on the drawings.
2. Connections shall be made at approximate locations as shown on drawings. Contractor is responsible for minor changes caused by actual site conditions.

C. Electrical Supply:

1. Electrical connections for automatic controller shall be made to electrical points of connection as indicated on the drawings.
2. Connections shall be made at approximate locations as shown on drawings. Contractor is responsible for minor changes caused by actual site conditions.

3.3 INSTALLATION

- A. Trenching. Before trenching, Contractor shall verify the final grade is at (+-) 1/10". Dig trenches straight and support pipe continuously on bottom of trench. Lay pipe to an even grade. Trenching excavation shall follow layout indicated on drawings and as noted. If the bottom of a pipe trench excavation is found to consist of rock, caliche, or any other material that, by reason of its hardness, cannot be excavated to give a uniform bearing surface, said rock or other material shall be removed for at least three inches (3") below the specified trench depth, and be refilled to specified trench depth with sand or similar material thoroughly tamped into place. Trenches shall be of sufficient depth to provide minimum earth coverage from finish grade as follows:

1. Pressure mainline: 24 inches
2. Control wires: 24 inches
3. Lateral rotary sprinkler heads: 16 inches

4. Emitter, spray heads and bubbler laterals: 12 inches
5. Sleeves under vehicular paving: 24 inches
6. All other sleeves: 18 inches
7. Electrical conduit: 24 inches

B. Backfilling:

1. The trenches shall not be backfilled until all required tests are performed. Trenches shall be carefully backfilled in 6" lifts with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand, or other approved materials, free from large clods of earth or stones. Backfill shall be mechanically compacted in landscaped areas to a dry density equal to adjacent undisturbed soil in planting areas. Backfill will conform to adjacent grades without dips, sunken areas, humps or other surface irregularities.
2. A fine granular material backfill will be initially placed on all lines to a depth of 4" over the top and bottom of the pipe, per COS Detail 2642. No foreign matter larger than 1/2" in size will be permitted in the initial backfill on top pipe.
3. All trenches will be water settled. Flooding of trenches will be permitted only with approval of the Owner's Representative from Community Maintenance and Recreation.
4. If settlement occurs and subsequent adjustments in pipe, valves, sprinkler heads, lawn or planting, or other construction are necessary, the Contractor shall make all required adjustments without cost to the Owner.

C. Trenching and Backfill Under Paving:

1. Trenches located under areas where paving, asphaltic concrete or concrete will be installed shall be backfilled with sand (a layer six inches below the pipe and three inches above the pipe) and compacted in layers using manual or mechanical tamping devices. Trenches for piping shall be compacted to equal the compaction of the existing adjacent undisturbed soil and shall be left in a firm unyielding condition. All trenches shall be left flush with the adjoining grade. The sprinkler irrigation Contractor shall set in place, cap and pressure test all piping under paving prior to the paving work.
2. Compaction percentage of backfill material shall be based on recommendations of the Soils Report. If Soils Report is not available, compaction shall be based on MAG Section 601.
3. Generally, piping under existing walks is done by jacking, boring or hydraulic driving, but where any cutting or breaking of existing sidewalks and/or concrete is necessary, it shall be done and replaced by the Contractor as part of the contract cost. Permission to cut or break sidewalks and/or concrete shall be obtained from the Owner's Representative. Hydraulic driving will be permitted under concrete paving provided an 18" minimum depth is maintained.
4. Provide for a minimum cover of 24" between the top of the pipe and the bottom of the aggregate base for all pressure and non-pressure piping installed under asphaltic concrete paving.
5. Provide Schedule 40 PVC sleeves for all piping under paving. Sleeve shall be 2 times the diameter of the pipe being sleeved. Provide one sleeve per pipe.

D. Assemblies:

1. Routing of sprinkler irrigation lines as indicated on the drawings is diagrammatic. Install lines and various assemblies to conform with the details shown on drawings and in accordance with the manufacturer's recommendations.
2. Install no multiple assemblies on plastic lines. Provide each assembly with its own outlet.
3. Install all assemblies specified herein in accordance with respective detail. In absence of detail drawings or specifications pertaining to specific items required to complete work, perform such work in accordance with best standard practice with prior approval of Owner's Representative from Community Maintenance and Recreation.
4. PVC pipe and fittings shall be thoroughly cleaned of dirt, dust and moisture before installation. Installation and solvent-welding methods shall be as recommended by the pipe and fitting manufacturer. Primer shall be used on all solvent weld joints.
5. On PVC to metal connections, the Contractor shall work the metal connections first. Teflon tape on all threaded PVC-to-metal joints. Light wrench pressure is all that is required.

Where threaded PVC connections are required, use threaded Schedule 80 tee with Schedule 40 coupling into which the pipe may be welded. PVC male adaptors will not be allowed.

6. Thrust Blocks: Concrete thrust blocks shall be installed at all end plugs, ells and tees in main lines.
- E. Line clearance. All lines shall have a minimum clearance of 12 inches from lines of other trades. Parallel lines shall not be installed directly over one another and shall have enough distance to facilitate bedding and compaction.
- F. Automatic controller. Install as per manufacturer's instructions. Remote control valves shall be connected to controller in numerical sequence as shown on the drawings. Controller station valve/schedule assignments shall be approved by the owners representative from Community Maintenance and Recreation. The controller shall be grounded with an 8' x 5/8" copper clad ground rod located as close as practical to the controller and connected with #10 wire minimum. Approved clamps shall be used. One ground rod per controller approved by Community Maintenance and Recreation.
- G. High-voltage Wiring for Automatic Controller
 1. 120 -volt power connection to the automatic controller shall be provided by the Irrigation Contractor.
 2. All electrical work shall conform to local codes, ordinances, and governing authorities having jurisdiction.
- H. Remote control valves. Install where shown on drawings and details. When grouped together, allow at least 12" between valves. Install each remote control valve in a separate valve box. Locate adjacent to walks or curbs where possible. Identify each valve with a permanent marker, tied to stem, with controller and station identification marked. Provide one mainline tap for each lateral line valve.
- I. Flushing of System:
 1. After all new sprinkler pipe lines and risers and emitters are in place and connected, all necessary diversion work has been completed, and prior to installation of sprinkler heads, the control valves shall be opened and a full head of water used to flush out the system.
 2. Sprinkler heads shall be installed only after flushing of the system has been accomplished to the complete satisfaction of the Owner's Representative from Community Maintenance and Recreation.
- J. Sprinkler Heads:
 1. Install the sprinkler heads as designated on the drawings. Sprinkler heads to be installed in this work shall be as shown on the drawings.
 2. Spacing of heads shall not exceed the maximum indicated on the drawings. In no case shall the spacing exceed the maximum recommended by the manufacturer.
 3. Ensure 200% coverage (head to head).

3.4 TEMPORARY REPAIRS

- A. The Owner reserves the right to make temporary repairs as necessary to keep the sprinkler system equipment in operating condition. The exercise of this right by the Owner shall not relieve the Contractor of his responsibilities under the terms of the guarantee as herein specified.

3.5 EXISTING TREES

- A. Where it is necessary to excavate adjacent to existing trees, the Contractor shall use all possible care to avoid injury to trees and tree roots. Excavation in areas where two-inch and larger roots occur shall be done by hand. All roots two inches and larger in diameter, except directly in the path of pipe or conduit, shall be tunneled under and shall be heavily wrapped with burlap to prevent scarring or excessive drying. Where a ditching machine is run close to trees having roots smaller than two inches in diameter, the wall of the trench adjacent to the tree shall be hand trimmed, making clean cuts through. Roots one inch and larger in diameter shall be painted with two coats of Omni/Soil Sulfur or equal. Trenches adjacent to trees, should be closed within 24 hours, and where this is not possible, the side of the trench adjacent to the tree shall be kept shaded with burlap or canvas.

3.6 FIELD QUALITY CONTROL

A. Adjustment of the System:

1. The Contractor shall flush and adjust all sprinkler heads for optimum performance and to prevent overspray onto walks, roadways, and buildings as much as possible.
2. If it is determined that adjustments in the irrigation equipment will provide proper and more adequate coverage, the Contractor shall make such adjustments prior to planting. Adjustments may also include changes in nozzle sizes and degrees of arc as required. Such changes shall be approved in advance by the Owner's Representative from Community Maintenance and Recreation.
3. Lowering raised sprinkler heads by the Contractor shall be accomplished within 10 days after notification by Owner Representative from Community Maintenance and Recreation.
4. All sprinkler heads shall be set perpendicular to finished grades unless otherwise designated on the plans. On slopes, heads shall be angled for optimum coverage.
5. Owner's Representative from Community Maintenance and Recreation to approve all head locations and reserves the right to request Contractor to make minor adjustments to head or emitter placement or nozzle selection at no cost to the Owner.

B. Testing of Irrigation System:

1. The Contractor shall request the presence of the Owner's Representative from Community Maintenance and Recreation at least 48 hours in advance of testing. Call 480-312-2189.
2. Test all pressure lines under hydrostatic pressure of 150 lbs./sq. in. and prove watertight. **NOTE:** Testing of pressure main lines shall occur prior to installation of electric control valves.
3. All piping under paved areas shall be tested under hydrostatic pressure of 150 lbs./sq. in. and proved watertight prior to paving.
4. Sustain pressure in lines for not less than two hours. Pipe sections shall be center loaded and all couplings shall be exposed. Before testing, the line shall have been filled with water for at least four (4) hours and provisions made for thoroughly bleeding the line of air.

5. All hydrostatic tests shall be made only in the presence of the Owner's Representative from Community Maintenance and Recreation. No pipe shall be backfilled until it has been inspected, tested and approved in writing.
6. Contractor shall furnish necessary force pump and all other test equipment.
7. When the sprinkler irrigation system is completed, perform a coverage test in the presence of the Owner's Representative from Community Maintenance and Recreation to determine if the water coverage for planting areas is complete and adequate. Furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from plans or where the system has been willfully installed as indicated on the drawings when it is obviously inadequate without bringing this to the attention of the Owner's Representative from Community Maintenance and Recreation. This test shall be accomplished before any ground cover is planted.
8. Upon completion of each phase of work, the entire system shall be tested and adjusted to meet site requirements.

3.7 MAINTENANCE

- A. The entire sprinkler irrigation system shall be under full automatic operation for a period of seven days with all malfunctions and leaks corrected prior to any planting.
- B. The Owner's Representative from Community Maintenance and Recreation reserves the right to waive or shorten the operation period.

3.8 CLEANUP

- A. Cleanup shall be made as each portion of work progresses. Refuse and excess dirt shall be removed from the site, all walks and paving shall be broomed or washed down, and any damage sustained on the work of others shall be repaired to the original conditions acceptable to the Owner's Representative from Community Maintenance and Recreation.

3.9 FINAL OBSERVATION PRIOR TO ACCEPTANCE

- A. The Contractor shall operate each system in its entirety for the Owner's Representative from Community Maintenance and Recreation at the time of final observation. Any items deemed not acceptable shall be reworked to the complete satisfaction of the Owner's Representative.
- B. The contractor shall show evidence to the Owner's Representative from Community Maintenance and Recreation that the Owner has received all accessories, charts, record drawings, and equipment as required before final observation can occur.

3.10 OBSERVATION SCHEDULE

- A. Contractor shall be responsible for notifying the Owner's Representative from Community Maintenance and Recreation in advance for the following observations according to the time indicated:
 1. Pre-job conference – Seven (7) days.
 2. Pressure supply line installation and testing – 48 hours.
 3. Automatic controller installation – 48 hours.
 4. Control wire installation – 48 hours.
 5. Lateral line and sprinkler installation – 48 hours.
 6. Coverage test – 48 hours.
 7. Final observation – Seven (7) days.
 8. Emitter lateral and extension line placement – 48 hours.
 9. Emitter operation – 48 hours.

- B. When inspections have been conducted by other than the Owner's Representative from Community Maintenance and Recreation, show evidence **in writing** of when and by whom these inspections were made.

END OF SECTION

FIGURE 7.1-6

LANDSCAPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

1. Trees.
2. Shrubs.
3. Ground covers.
4. Plants.
5. Lawns
6. Topsoil and soil amendments.
5. Proper staking..
6. Landscape edgings.

- B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 2 Section "Site Clearing" for protection of existing trees and planting, topsoil stripping and stockpiling, and site clearing.
2. Division 2 Section "Earthwork" for excavation, filling, rough grading, and subsurface aggregate drainage and drainage backfill.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

- B. Product certificates signed by manufacturers certifying that their products comply with specified requirements.

1. Manufacturer's certified analysis for standard products.
2. Analysis for other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
3. Label data substantiating that plants, trees, shrubs, and planting materials comply with specified requirements.

- C. Certification of grass seed from seed vendor for each grass-seed mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed content. Include the year of production and date of packaging.

- D. Samples of each of the following:

1. 5 lb (2 kg) of granite stone mulch for each color and texture of stone required for Project, in labeled plastic bags.

- E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and address of architects and owners, and other information specified.
- F. Material test reports from qualified independent testing agency indicating and interpreting test results relative to compliance of the following materials with requirements indicated.
 - 1. Analysis of imported topsoil (by certified soil laboratory).
- G. Planting schedule indicating anticipated dates and locations for each type of planting.
- H. Maintenance instructions recommending procedures to be established by Owner for maintenance of landscaping during an entire year. Submit before expiration of required maintenance periods.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.
 - 1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that landscaping is in progress.
- B. Testing Agency Qualifications: To qualify for acceptance, an independent testing agency must demonstrate to Architect's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.
- C. Provide quality, size, genus, species, and variety of trees and shrubs indicated, complying with applicable requirements of ANSI Z60.1 "American Standard for Nursery Stock."
- D. Topsoil Analysis: Furnish a soil analysis made by a qualified independent soil-testing agency stating percentages of organic matter, inorganic matter (silt, clay, and sand), deleterious material, pH, and mineral and plant-nutrient content of topsoil.
 - 1. Report suitability of topsoil for growth of applicable planting material. State recommended quantities of nitrogen, phosphorus, and potash nutrients and any limestone, aluminum sulfate, or other soil amendments to be added to produce a satisfactory topsoil.
- E. Measurements: Measure trees and shrubs according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches (150 mm) above ground for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings." Prior to planting of trees and shrubs with City owners and contractor discuss the Community Maintenance and Recreation planting details.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. **Packaged Materials:** Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.
- B. **Trees and Shrubs:** Do not prune before delivery, except as approved by Community Maintenance and Recreation Representative. Protect bark, branches, and root systems from sunburn, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy natural shape. Provide protective covering during delivery. Do not drop trees and shrubs during delivery of all plant material, this includes flatbed semi-trailer.
- C. **Deliver trees, shrubs, ground covers, and plants** after preparations for planting have been completed and install immediately. If planting is delayed more than 6 hours after delivery, set planting materials in shade, protect from weather and mechanical damage, and keep roots moist. Contractor is responsible for providing water to plant material on site.
 - 1. Do not remove container-grown stock from containers before time of planting. Option of Community Maintenance and Recreation to sample 2% of lot material.
 - 2. Water root systems of trees and shrubs stored on site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.6 PROJECT CONDITIONS

- A. **Utilities:** Determine location of above grade and underground utilities and perform work in a manner which will avoid damage. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.
- B. **Excavation:** When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Architect before planting.
- C. **Clean backfill (native backfill)** no rocks larger than ½" diameter.

1.7 COORDINATION AND SCHEDULING

- A. **Coordinate installation of planting materials** during normal planting seasons for each type of plant material required.
- B. **Schedling:** Irrigation system shall be operational in both landscape and turf areas before being planted.
- C. **Turf:**
 - October-March—overseed bermuda sod
 - March-October 1—bermuda sod
 - June 1-July 26—selected bermuda seed type or hybrid stolens

1.8 WARRANTY

- A. **General Warranty:** The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. **Special Warranty:** Warrant the following living planting materials for a period of one year after date of Final Completion, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, abnormal weather conditions unusual for warranty period, or incidents that are beyond Contractor's control.

- C. Remove and replace dead planting materials immediately. All plants to be replaced in-kind size specified in the original design.
- D. Replace planting materials that are in an unhealthy condition at end of warranty period.

1.9 TREE AND SHRUB MAINTENANCE

- A. Maintain trees and shrubs by cultivating, watering, weeding, fertilizing, following Community Maintenance and Recreation planting details, tightening and repairing stakes, and resetting to proper grades or vertical position. Spray as required to keep trees and shrubs free of insects and disease. Maintain trees and shrubs for the following period:
 - 1. Maintenance Period: 3 months following final acceptance.

1.10 GROUND COVER AND PLANT MAINTENANCE

- A. Maintain ground cover and plants by watering, weeding, fertilizing, and other operations as required to establish healthy, viable plantings for the following period:
 - 1. Maintenance Period: 3 months following final acceptance.

1.11 LAWN MAINTENANCE

- A. Begin maintenance of lawns immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:
 - 1. Seeded Lawns: 60 days after date of final acceptance.
 - a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established at that time, continue maintenance during next planting season. Lawns shall be substantially complete when entire area is covered with uniformly and mowed to a uniform height of 1 ½ inch.
- B. Maintain and establish lawns by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.
- C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawns uniformly moist to a depth of 4 inches (100 mm).
- D. Mow lawns as soon as there is enough top growth to cut with mower set at specified height for principal species planted. Repeat mowing as required to maintain specified height without cutting 1/3 height of the grass. Remove no more than 1/3 inch of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Never mow grass when wet. All mowing schedules will be confirmed by Community Maintenance and Recreation representative.
- E. Postfertilization: Apply fertilizer to lawn after first mowing and when grass is dry, then schedule water cycle.
 - 1. Use fertilizer that will provide actual nitrogen of at least 1 lb. Per 1,000 sq. ft. (0.5 kg per 100 sq. m) of lawn area.

PART 2 - PRODUCTS

2.1 TREE AND SHRUB MATERIAL

- A. General: Furnish nursery-grown trees and shrubs conforming to ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully-branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
- B. Grade: Provide trees and shrubs of sizes and grades conforming to ANSI Z60.1 for type of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.
- C. Label at least 1 tree and 1 shrub of each variety and caliper with a securely attached, waterproof tag bearing legible designation of botanical and common name.
- D. Plants protected by federal trademark or patent must include the correct name with genus and species along with registered cultivar name and be attached to all plants delivered and planted on specific project.

2.2 GRASS MATERIALS

- A. Grass Seed: Fresh, clean dry, new-crop seed complying with the Association of Official Seed Analysts' "Rules for Testing Seeds" for purity and germination tolerances.
 - 1. Seed Mixture: Provide Bermuda Triangle (mix of Sultan, Sidney and Yuma), 80% minimum germination, 85% minimum pure live seed, 0.5% maximum weed seed.
- B. Sod: Hybrid Bermuda 328 overseeded perennial rye with winter grass variety approved by Community Maintenance and Recreation.
 - 1. Sod shall be $\frac{3}{4}$ inch thick.
 - 2. Size of sod pad shall be cut not less than 12 inches x 24 inches nor more than 42 inches x 96 inches. Torn or uneven ends are unacceptable.
 - 3. Sod shall not break apart when handled and be moist and fresh upon arrival to site.
 - 4. Sod shall be mowed prior to cutting.
 - 5. Sod shall be scrim free during installation.

2.3 DESERT RESTORATION

- A. Hydroseed: Seed mixture shall consist of the following varieties at the rates shown below. Seed mixture shall be applied with the wood fiber mulch slurry.

| PLS#/ACRE | BOTANICAL NAME | COMMON NAME |
|-----------|--------------------------|--------------------|
| 2 | ENCELIA FARINOSA | BRITTLEBUSH |
| 1 | VIGUERIA DELTOIDEA | SHRUBBY GOLDEN EYE |
| 2 | AMBROSIA DELTOIDEA | BURSAGE |
| 4 | PLANTAGO INSULARIS | INDIAN WHEAT |
| 2 | CASSIA COVESII | DESERT SENNA |
| 1 | LOTUS RIGIDA | ROCK PEA |
| 1 | GUITERREZIA MICROCEPHALA | SNAKEWEED |
| 1 | HALOPAPPUS ACRADENIUS | TURPENTINE BUSH |

14 TOTAL PER ACRE

ALL SEED QUOTED IN PLS POUNDS PER ACRE.
PLS = PURE LIVE SEED = PURITY X GERMINATION SEED TO BE
BROADCAST ACCORDING TO RECOMMENDED RATES. RAKE INTO
SURFACE 1/4".

- B. Application rates of seed as specified are for Pure Live Seed (PLS). $PLS = (\% \text{ germination} + \% \text{ hard or dormant}) \times \% \text{ purity}$. Weed content of seed shall not exceed .05%.
- C. Binder: Binder shall be a free flowing, non-corrosive powder produced from natural plant gum of *Plantago Insulares* (Indian Wheat) such as Muciloid Tac or approved equal. Binder shall be applied at 40 lbs. per acre on slopes less than 3:1 and 80 lbs per acre on slopes 3 to 1 and above.
- D. Wood Fiber Mulch: Wood fiber mulch shall consist of a specially prepared virgin wood fiber processed to contain no growth or germination inhibiting factors. Further, the mulch shall be manufactured and processed so the wood cellulose fibers will remain in uniform suspension in water under agitation and will blend with seed, fertilizer, and other additives to form a homogeneous slurry. The processed mulch material shall have characteristics to form a blotter-like ground cover on application, with moisture and percolation properties and the ability to cover and hold seed in contact with the soil. Wood fiber mulch shall be applied at 2000 lbs per acre.

2.4 TOPSOIL

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 8, 4 percent organic material minimum, free of stones $\frac{1}{2}$ inch (25mm) or larger in any dimension, and other extraneous materials harmful to plant growth.
 - 1. Topsoil Source: Reuse surface soil stockpiled on the site for planter areas. Import topsoil for turf areas. Verify suitability of surface soil to produce topsoil meeting requirements and amend when necessary.
 - 2. Turf area topsoil shall be an organic material free of deleterious material with a pH of 5.5 to 8.0. Maximum soluble salts shall be 1500 ppm. Soil texture shall be as follows: sand 60%-90%, clay 10%-20%, silt 10%-20%. The soil shall be classified as loamy sand or sandy loam. Volume of stones, cinders, slag, or extraneous material shall not exceed five percent. Obtain topsoil from an offsite borrow area selected by the Contractor and approved by the Architect-Engineer. Onsite stockpiled topsoil may be used in planter areas if meeting the above specifications.

2.5 SOIL AMENDMENTS

- A. Sand: Clean, washed, natural or manufactured sand, free of toxic materials.
- B. Peat Humus: Finely divided or granular texture, with a pH range of 6 to 7.5, composed of partially decomposed Daota peat (other than sphagnum), peat humus, or reed-sedge peat.
- C. Sawdust or Ground-Bark Humus: Decomposed, nitrogen-treated, of uniform texture, free of chips, weed pathogens, stones, sticks, soil, or toxic materials.
 - 1. When site treated, mix with at least 0.15 lb (2.4 kg) of ammonium nitrate or 0.25 lb (4 kg) of ammonium sulfate per cu. Ft. (cu. M) of loose sawdust or ground bark.
- D. Manure: Well-rotted, unleached stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed pathogens, and material harmful to plant growth.
- E. Herbicides: EPA registered and approved, of type recommended by manufacturer.
- F. Water: Potable.

2.6 FERTILIZER

- A. Superphosphate: Homogenous commercial 0-45-0, phosphate mixture, soluble; minimum of 20 percent available phosphoric acid.
- B. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea-form, phosphorous, and potassium in the following composition:
 - 1. Composition: 1 lb per 1000 sq. ft. (0.5 kg per 100 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.
- C. Slow-Release Fertilizer: Granular fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in homogenous composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.
- D. Tree and shrub fertilizer shall be a complete, commercially available inorganic material. Fertilizer shall contain sulfur coated slow release components.
- E. All fertilizers and application shall be as required by the soils analysis of the import soil.

2.7 MULCHES

- A. Peat Mulch: Provide Dakota peat moss in natural, shredded, or granulated form, of fine texture, with a pH range of 4 to 6 and a water-absorbing capacity of 1100 to 2000 percent.
- B. Fiber Mulch: Biodegradable dyed-wood cellulose-fiber mulch, nontoxic, free of plant growth- or germination-inhibitors, with maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.
- C. Asphalt Emulsion Tackifier: Asphalt emulsion, ASTM D 977, Grade SS-1, nontoxic and free of plant growth- or germination-inhibitors.
- D. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application, nontoxic and free of plant growth- or germination-inhibitors.
- E. Mineral Mulch: Hard, durable stone, washed free of loam, sand, clay, and other foreign substances, of following type, size range, and color:
 - 1. Type: Decomposed granite.
 - 2. Size Range: 1/2 inch (19 mm) maximum, 1/4 inch (6 mm) minimum.
 - 3. Color: Readily available natural gravel color range, similar to naturally occurring onsite materials.

2.8 WEED-CONTROL BARRIERS

- A. Pre-emergent type herbicide.

2.9 STAKES

- A. Upright Stakes: Comply with Community Maintenance and Recreation Planting Detail. Dound, 2 inch, pressure-preservative-treated lodge poles, free of knots, holes and other defects.

- B. Tie Wire: ASTM A 641 (ASTM A 641M), Class 1, galvanized-steel wire, 2-strand, twisted, 0.106 inch (2.7 mm) in diameter.
- C. Hose Chafing Guard: Reinforced rubber or plastic hose at least 1/2 inch (13 mm) in diameter, black, cut to lengths required to protect tree trunks from damage.
- D. Flags: Standard surveyor's plastic flagging tape, white, 6 inches (150 mm) long.

2.10 SOIL STABILIZER

- A. Stabilizer to be applied to desert pavement areas indicated on plans or approved equal by Community Maintenance and Recreation representative.
 - 1. "Stabilizer" as manufactured by Stabilizer, 22nd Street & Magnolia, Phoenix, Arizona 85018, (602) 225-5900.
- B. Ballfield infield mix shall consist of crushed Coral granite fines, as processed by Fort McDowell Sand and Gravel and Stabilizer organic binder. Stabilizer is to be mechanically blended with the fines in a pug mill type blender with a metered feeder unit which mechanically measures Stabilizer to the fines at a rate of 20 lbs. Of Stabilizer per 1-ton of fines.

To ensure that a proper blend has been attained, Chuck Dixon at Turf Diagnostic and Design Lab, 310-A North Winchester, Olathe, Kansas shall conduct a Stabilizer recovery test, at the contractor's expense.

Submit two 1-gallon samples of fines, one before treatment and one after treatment. A Stabilizer recovery test will also be required for mound and homeplate mixes and warning track mix.

The Coral fines must meet the USDA particle size analysis in the range as follows for the infield mix:

| | ACCEPTABLE RANGE |
|----------------------------------|------------------|
| GRAVEL | 0 – 2.0% |
| COARSE | 30 – 35% |
| MEDIUM FINE SAND | 45 – 50% |
| SILT AND CLAY | 15 – 20% |
| BULK DENSITY | 1.5 |
| STABILIZER BINDER ORGANIC MATTER | 1.0% |
| TOTAL PORE SPACE | 41 |
| UNIFORMITY COEFFICIENT CU | 5.0 |

- C. Ballfield mound and homeplate mix will also be blended with Stabilizer, clay and Coral fines to the following specifications and must meet USDA particle size analysis as follows:

| | MOUND AND HOMEPLATE MIX RANGE |
|------------------------------------|-------------------------------|
| GRAVEL | 0 – 2" |
| VERY COARSE | 20 – 25% |
| COARSE | 20 – 25% |
| MEDIUM AND FINE | 25 – 30% |
| SILT AND CLAY | 50 – 60% |
| STABILIZER CONTENT 12 LBS. PER TON | .6% |

- D. Ballfield warning track mix will consist of ¼" minus Coral granite and Stabilizer, which meet the following specifications:

WARNING TRACK MIX

| | |
|------------------------------------|------|
| 1/4" | 100% |
| #4 | 99% |
| #8 | 74% |
| #10 | 68% |
| #16 | 51% |
| #30 | 34% |
| #40 | 27% |
| #50 | 21% |
| #100 | 12% |
| #200 | 6% |
| STABILIZER CONTENT 20 lbs. per ton | 1.0% |

2.11 GRANITE BOULDERS

- A. Boulders shall be surface select, free of equipment marks and cracks. Size as indicated on the drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive landscaping for compliance with Community Maintenance and Recreation representative requirements and for conditions affecting performance of work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, and secure City of Scottsdale's Community Maintenance and Recreation representative for acceptance before the start of planting work.

3.3 PLANTING SOIL PREPARATION

- A. Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
- E. Mix soil amendments and fertilizers with topsoil at rates indicated for lawn areas. Delay mixing fertilizer if planting does not follow placing of planting soil within a few days.
- F. Tree and shrub backfill shall be native soil per Community Maintenance and Recreation detail.
- G. For lawns, mix imported topsoil with recommended amounts of fertilizer and 1/10 percent (by volume) Dakota peat mulch.

3.4 LAWN PLANTING PREPARATION

- A. Limit subgrade preparation to areas that will be planted in the immediate future.
- B. Loosen subgrade to a minimum depth of 4 inches (100 mm). Remove stones larger than ½ inches (38 mm) in any dimension and sticks, roots, rubbish, and other extraneous materials.
- C. Spread planting soil mixture to a minimum depth of 12 inches, after light rolling and natural settlement.
- D. Grade lawn and grass areas to a smooth, even surface with loose, uniformly fine texture. Roll and water settle, rake, remove ridges, and fill depressions to meet final grade. Limit fine grading to areas that can be planted in the immediate future. Remove trash, debris, stones larger than ½ inch (38 mm) in any dimension, and other objects that may interfere with planting or maintenance operations.
- E. Moisten prepared lawn areas before planting when soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- F. Restore prepared areas if eroded or otherwise disturbed after fine grading and before planting.

3.5 EXCAVATION FOR TREES AND SHRUBS

- A. Pits and Trenches: Excavate with vertical sides and with bottom of excavation slightly raised at center to assist drainage. Loosen hard subsoil in bottom of excavation.
 - 1. Container-Grown Trees and Shrubs: Excavate to 1-1/2 time the container width. Follow Community Maintenance and Recreation planting detail.
- B. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
 - 1. Hardpan Layer: Increase planting pit.
- C. Fill excavations with water and allow to percolate out, before placing setting layer and positioning trees and shrubs.

3.6 PLANTING TREES AND SHRUBS

- A. Set container-grown stock plumb and in center of pit or trench with top of ball raised above adjacent finish grades as indicated.
 - 1. Carefully remove containers so as not to damage root balls.
 - 2. Place stock on setting layer of compacted planting soil.

3. Place backfill around ball in layers, tamping to settle backfill. When pit is approximately 1/2 backfilled, water thoroughly before placing remainder. Repeat watering until no more is absorbed. Water again after placing and tamping final layer of backfill.

B. Perform planting in accordance with City of Scottsdale Standard Details and Specifications.

3.7 TREE AND SHRUB PRUNING

A. Prune, thin, and shape trees and shrubs according to ANZI standard A-300

3.8 TREE AND SHRUB STAKING

A. Upright Staking and Tying: Stake trees per Community Maintenance and Recreation planting detail of 2- through 5-inch (50- through 125-mm) caliper. Stake trees of less than 2-inch (50-mm) caliper only as required to prevent wind tip-out. Use a minimum of 2 stakes of length required to penetrate at least 18 inches (450 mm) below bottom of backfilled excavation and to extend at least 72 inches (1800 mm) above grade. Set vertical stakes and space to avoid penetrating balls or root masses. Support trees with 2 strands of tie wire encased in hose sections at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

3.9 PLANTING GROUND COVER AND PLANTS

A. Space ground cover and plants as indicated.

B. Space ground cover and plants not more than 48 inches (600 mm) apart.

C. Dig holes large enough, 1 ½ times rootball size, to allow spreading of roots, and backfill with planting soil. Water thoroughly after planting.

3.10 MULCHING

A. No mulch in backfill of planted areas. Mulch on surface at final grade..

B. Granite: Apply the following average thickness of granite and finish level with adjacent finish grades. Do not place mulch against trunks or stems.

1. Thickness: >2 inches (50 mm).

C. Desert Pavement from stockpiles shall be spaced to a depth of 2 inches in all disturbed by grading and not receiving other ground treatment. The finished appearance shall be that of the surrounding natural desert. Pre-emergent shall not be applied in desert pavement areas.

3.11 HYDROSEEDING NEW LAWNS

A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogenous slurry suitable for hydraulic application.

1. Hydroseed mixture shall contain the following:

| <u>Material</u> | <u>Quantity</u> |
|-----------------|-------------------------------------|
| Seed | 2 lbs./1,000 S.F. |
| Fertilizer | As indicated by Laboratory Analysis |
| Wood Fiber | 1500 lbs./Acre |

2. Mix slurry with nonasphaltic tackifier.
3. Apply slurry uniformly to all areas to be seeded in a 2-step process. Apply first slurry application at the minimum rate of 500 lb per acre (5.5 kg per 100 sq. m) dry weight but not less than the rate required to obtain specified seed-sowing rate. Apply slurry cover coat of fiber mulch at a rate of 1000 lb per acre (11 kg per 100 sq. m).

3.12 SOD (ALTERNATE NO. 2)

- A. Lay sod perpendicular to direction of slope and in a manner permitting end of pad joints to alternate. Lay sod tightly together. Do not stretch pad or overlap joints. Tamp, secure sod on slopes greater than one vertical to three horizontal. Netting scrim must be removed.
- B. Water sod immediately after installation to a depth of 1 inch below sod. After a short drying period, roll sod and smooth minor surface irregularities.

3.13 HYDROSEEDING/RESTORATION AREAS

1. After the surface treatment is completed and accepted by the Architect, seed mix shall be hydroseeded.
2. The following materials shall be combined to form a seed mulch mixture for hydroseeded applications.
 - a. Seed mix
 - b. Binder
 - c. Wood Fiber Mulch
 - d. Sufficient water to form a homogenous mixture capable of being applied by commercial hydromulching equipment.
3. Hydroseeding which is deposited on adjacent trees and shrubs, roadways, in drain ditches, on structures, and upon any area where seeding is not specified or which is placed in excessive depths on seeding areas shall be removed.
4. Seeding areas flooded or eroded as a result of irrigation shall be repaired, reseeded, and refertilized by the Contractor at his expense.
5. Care During Construction: The Contractor shall be responsible for protecting and caring for seeded areas until final acceptance of the work and shall repair, at his expense, any damage to seeded areas caused by pedestrian or vehicular traffic or other causes. Provide temporary irrigation. Utilize quick coupling valves on main line. Contractor is responsible for design of the temporary irrigation system beyond the quick couplers. Temporary irrigation shall be provided by the Contractor to germinate and establish native seeding. The system utilized to water the Native Seed areas shall be as selected by the Contractor and shall be included in the price Bid for Native Seed.
6. Germination: Seed germination is dependent upon a variety of factors, many of which are interacting. Temperature, light time of year, internal seed dormancy, gas exchange, and moisture are involved in seed germination.
 - a. Under favorable conditions, most non-dormant desert seeds will germinate in 7 to 10 days with constant available moisture. Watering should not be so much that it runs off or puddles. Frequent light applications of water are generally needed for good germination results. It will probably be necessary to irrigate several times per day if it is hot, windy, or the soil is well drained or sloped. Irrigation 4 to 6 times per day is not uncommon. Irrigation should be checked daily for run off and drying between cycles. Careful attention by the Contractor is required because too wet or too dry of conditions will affect germination.
 - b. Following germination of approximately 80% of the Pure Live Seed, or as accepted by the Architect, the Contractor shall request start of the Native Seed establishment

- period. The establishment period shall be for 90 days from the start date set by the Architect.
- c. Establishment: Establishment is considered to be after germination and before plant maturity. Water during the establishment period shall be that of gradual decrease in water application. The intent is to provide water in soil profiles where it is retained and where root growth occurs. Decreasing the water frequency allows for natural characteristics of drought tolerance to develop.
 - d. The Contractor shall inspect the ground closely as soon as plants have emerged, as many seedlings are small and inconspicuous. Adjust water frequency accordingly. Inspection of plants and soil will determine the watering requirements during the establishment period. Wilting is an obvious sign of water stress. Overwatered plants may appear yellow due to nutrient deficiency or very lush with excess growth. Overwatered plants will not develop drought resistance.
 - e. Water after germination should be 1 to 3 times per week on average, however, this is a variable depending on many factors. Water should be allowed to soak the soil profile as deeply as possible to encourage deep rooting. As the plants mature and develop woody tissue, the water can be decreased dramatically and temporary irrigation suspended or removed.
 - f. The Contractor shall be responsible to re-apply hydromulch and seek until establishment is acceptable to the Architect based on 40% of the germinated plants surviving with no increase costs to the Contract. Maintenance of Native seed areas shall be concurrent with establishment of these areas.

3.14 CLEANUP AND PROTECTION

- A. During landscaping, keep pavements clean and work area in an orderly condition.
- B. Protect landscaping from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

3.15 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of it off the Owner's property.

END OF SECTION

Section 7.2

Street Scapes **Design Standards and Policies** **Revised December 1999**

Chapter 7 **Landscaping**

Section 7.2

Streetscapes

PAGE INDEX

| SECTION | PARAGRAPH TITLE | PAGE |
|---------|---|------|
| 7-201 | GENERAL INFORMATION | 1 |
| 7-202 | STREETSCAPES | 1 |
| 7-203 | STREETSCAPE CHARACTER AREAS | 1 |
| | A. Downtown and Urban Character | |
| | B. Suburban Character | |
| | C. Transitional Arid Character | |
| | D. Natural Character | |
| | E. Blending of Abutting Character Areas | |
| 7-204 | SPECIFIC AREA DESIGN GUIDELINES | 2 |
| 7-205 | SCOTTSDALE GATEWAYS | 2 |
| 7-206 | GENERAL PLANTING REQUIREMENTS | 3 |
| | A. Maintenance Responsibility | |
| | B. Selection of plant species | |
| | C. Placement of trees and shrubs | |
| | D. Planting within sight distance triangles | |
| | E. Grading | |
| | F. Toppings and Mulches | |
| | G. Boulders | |
| | H. Hydroseeding and Natural Area Open Space Restoration | |
| | I. Modifications to existing streetscapes | |
| 7-207 | GENERAL IRRIGATION REQUIREMENTS | 5 |
| 7-208 | RELATED DOCUMENTS | 5 |
| 7-209 | SUMMARY | 5 |
| 7-210 | DEFINITIONS | 5 |
| 7-211 | SYSTEM PERFORMANCE REQUIREMENTS | 6 |
| 7-212 | SUBMITTALS | 6 |
| 7-213 | SUBMITTAL REQUIREMENTS | 6 |
| 7-214 | PRODUCT DELIVERY, STORAGE AND HANDLING | 7 |

| | | |
|-------|---------------------------------------|----|
| 7-215 | GUARANTEE | 7 |
| 7-216 | QUALITY ASSURANCE | 7 |
| 7-217 | PROJECT CONDITIONS | 8 |
| 7-218 | SEQUENCING AND SCHEDULING | 8 |
| 7-219 | EXTRA MATERIALS | 8 |
| 7-220 | IRRIGATION MATERIALS SELECTION | 8 |
| 7-221 | INSPECTION | 11 |
| 7-222 | PREPARATION | 12 |
| 7-223 | INSTALLATION | 12 |
| 7-224 | TEMPORARY REPAIRS | 14 |
| 7-225 | EXISTING TREES | 14 |
| 7-226 | FIELD QUALITY CONTROL | 15 |
| 7-227 | MAINTENANCE | 16 |
| 7-228 | CLEANUP | 16 |
| 7-229 | FINAL OBSERVATION PRIOR TO ACCEPTANCE | 16 |
| 7-230 | OBSERVATION SCHEDULE | 16 |
| 7-231 | NON CONFORMANCE | 16 |

FIGURE LIST

| FIGURE | DESCRIPTION | PAGE |
|--------|--|------|
| 7.2-1 | LANDSCAPE & IRRIGATION MAINTENANCE BLOCK | 3 |
| 7.2-2 | SPRINKLER GUARANTEE | 7 |



SECTION 7.2 STREETSCAPES

7-201 GENERAL INFORMATION

The purpose of this section is to outline the design standards for the City's streetscapes. Streetscapes are defined as the appearance of the corridor that exists along a street alignment between the buildings on each side of the street. This section is intended to aid designers in developing hardscape, landscape, irrigation and general aesthetic improvements for those spaces within the City's streetscape corridors.

7-202 STREETSCAPES

The City is divided into four main character areas for streetscapes. Refer to the "Streetscape Plan" which can be found within the City's General Plan – Environmental Design Element publication. This plan outlines the four character areas graphically. Each area has specific design standards that may not apply to other areas.

In addition to the character area design standards, additional requirements may be imposed through the Development Review process to meet certain ordinance and long term planning objectives. These additional requirements may be found in the zoning and development review cases and the general plan elements and specific design guidelines that are particular to the site.

7-203 STREETSCAPE CHARACTER AREAS

A. Downtown and Urban Character

This classification is given to the area of the city in which pedestrian comfort is a primary consideration. Design of these areas should concentrate on elements such as arcaded walkways, shade, decorative paving, and landscaping so that a comfortable setting can be created for this use-intensive area.

B. Suburban Character

The suburban character applies to areas of the city where compatibility should be achieved between pedestrians and transportation routes within a medium density

development pattern. Use of trees that are native and/or desert adapted and achieve a dense, broad canopy is encouraged for the main theme of the streetscape. Separation of pedestrians from vehicular traffic can be realized through the use of landscape areas and sidewalk alignment.

C. Transitional Arid Character

For areas of the city where the development pattern is medium to low, and the streetscape serves as a buffer between traffic and adjacent land uses, the transitional classification is applied. Landscape materials should include native plants or plants compatible with a desert environment. Special care should be given to the protection of existing vegetation and natural features that can be incorporated into the design.

D. Natural Character

Compatibility with the natural desert is typical of the natural streetscape designation. Plant selection should be native to the Upper Sonoran desert and densities should match the existing and adjacent natural character. The design elements for the Natural Character area are governed in part by the City's Environmentally Sensitive Lands Ordinance (ESLO). Refer to this ordinance for specific requirements on plant and materials selection.

E. Blending of Abutting Character Areas

Where two different character areas join, a blending of the two categories should occur to prevent a marked difference between opposing sides of streets. These guidelines apply to all landscaped areas within the public right-of-way. Areas between the right-of-way and building setback lines are encouraged to use the guidelines as well. Transitional areas which abut Environmentally Sensitive Lands (or the Natural Character) should use native plants as the primary selection in order to strengthen the tie to the natural desert and to prevent the spread of invasive, non-native species into the natural areas.

7-204 SPECIFIC AREA DESIGN GUIDELINES

In circumstances where a special theme is desired, the city may designate specific design standards to be implemented on select streets. There are certain streetscapes within the City of Scottsdale that have been addressed through the approval of these specific design guidelines. These include: 1st Avenue Streetscape, Downtown Design Guidelines, Via Linda Streetscape, Frank Lloyd Wright Boulevard Design Guidelines, Los Arcos Redevelopment Plan, Shea Boulevard Streetscape Guide and the Desert Foothills Character Plan. Refer to these publications for additional design requirements. Contact the One-Stop Shop at (480) 312-2500 for more information.

7-205 SCOTTSDALE GATEWAYS

Scottsdale shares common boundaries with several municipalities. When entering Scottsdale from a neighboring community, it is useful for residents and visitors to have a sense of arrival into the city. Through the use of a city limits identification system, those entering the city should be able to readily recognize their entrance into Scottsdale. The Gateways Map (refer to the City's General Plan Environmental Design Element) shows the locations of city entrance points.

7-206 GENERAL PLANTING REQUIREMENTS

All streetscape designs shall meet the following minimum requirements based upon the City's ordinances.

A. Maintenance Responsibility

1. Maintenance of the City's streetscapes will be the responsibility of the abutting development's property owner, developer or homeowner's association. This applies to all landscaping and irrigation within the defined streetscape. Maintenance responsibility of hardscape and other amenities is particular to each site and should be defined through the development review process.
2. The particulars for maintenance responsibility of streetscapes are to be stated on the final landscape plans submittal. The standard landscape maintenance block is shown in Figure 7.2-1. Any deviations from this standard require City approval and shall be defined in a separately recorded document.

**ALL LANDSCAPE AREAS AND MATERIALS,
INCLUDING THOSE LOCATED IN PUBLIC
RIGHTS-OF-WAY, SHALL BE MAINTAINED IN A
HEALTHY, NEAT, CLEAN AND WEED-FREE
CONDITION. THIS SHALL BE THE RESPONSIBILITY
OF THE _____**

(Property Owner, Developer or Homeowner's Association)

FIGURE 7.2-1

3. Medians within each particular streetscape shall be maintained as outlined in the Design Standards and Policies Manual Section 7-103.A

B. Selection of plant species

Streetscapes require a xeriscape / desert adapted plant species selection in most cases. All plant material used in public rights-of-way must be listed on the Arizona Department of Water Resources (ADWR) most current Low Water Use Plant List, available from ADWR. Public rights-of-way that are located in the Environmentally Sensitive Lands (ESL) Upper Desert and Hillside landforms must be landscaped with plants from the City of Scottsdale's Indigenous Plants for Environmentally Sensitive Lands list. This list is available in the City's One-Stop Shop. Refer to the Scottsdale Revised Code Section 49-78 and 49-79, Scottsdale Landscape Ordinance and the ESLO for additional specific plant selection requirements.

C. Placement of Trees and Shrubs

1. For planting details of trees, cacti, shrubs and groundcovers see "City of Scottsdale Supplemental Standard Details for Public Works Construction."

2. Trees shall be located so that the mature tree canopy does not extend into the street, unless a specific private maintenance program is established which would otherwise prevent a similar situation from occurring. Care should also be taken in locating trees so that there are no conflicts with public utilities.

D. Planting within sight distance triangles

Streetscape design must incorporate safety considerations through careful selection of plant material for planting within sight distance triangles. Areas must be maintained clear of planting and other streetscape improvements between the heights of two and seven feet as measured above the nearest street pavement elevation. Single trunk trees are permitted as long as their canopy is maintained above seven feet in height upon installation, as measured above the nearest street pavement elevation. Sight distance must be considered for vehicles entering and exiting the adjacent properties, as well as for vehicles using the abutting roadways. Refer to Section 3-101.J.3 for determining sight distance.

E. Grading

1. Mounding should not be used in the area designated as Downtown and Urban Character. Care should be taken when designing landscaped mounds within sight distance easements so that the plant canopy over the mounds does not exceed a height of twenty-four (24) inches as measured above the nearest street pavement elevation. All mounding should blend with the adjacent existing terrain.
2. The maximum slope of any mounding shall be 4:1 (25%).
3. The finished grade shall be smooth, uniform and a minimum of four (4) inches below the top of curb.

F. Toppings and Mulches

1. Decomposed granite may be used as a topping material in landscaped areas as defined in the landscape ordinance. In Environmentally Sensitive Lands, this should be replaced by raked, native soils.
2. Decomposed granite shall be one-half (1/2) inch minus in size.
3. Toppings shall be distributed to a depth of two (2) inches and coverage shall extend over all of the area served by irrigation to minimize the evaporation of irrigation water. Do not place mulch against plant trunks or stems.
4. Refer to "City of Scottsdale Supplemental Standard Details for Public Works Construction" for installation.
5. A sample shall be submitted to Inspection Services for approval prior to the contractor ordering and bringing onto the site.
6. Color of material shall match existing adjacent materials. If this cannot be readily determined, contact a representative of the City's Planning Inspection Unit at (480) 312- 5750 to determine an acceptable color.

G. Boulders

1. One-third of any boulder is to be set in ground. Refer to "City of Scottsdale Supplemental Standard Details for Public Works Construction" for further details on boulder placement.
2. Care should be taken in placing boulders within or adjacent to sight distance easements so that the maximum height of the protruding boulder within the sight

- distance easement is not more than two feet in height above the existing streetline elevation.
3. Boulders are considered fixed objects and shall not be placed within the roadside clear zone. Refer to Section 3-104.C.1 for placement criteria.

H. Hydroseeding and Natural Area Open Space Restoration

1. Streetscape areas of natural area open space as defined by the ESLO may be enhanced using a hydroseeding technique. Refer to the City of Scottsdale Community Maintenance and Recreation standards for hydroseeding (section 3.13 of the Standard Specifications and Details for Landscape and Irrigation.)
2. Seed mix shall be composed of native species as defined in the ESLO.

J. Modifications to Existing Streetscapes

1. Modifications and/or removal of existing landscaping, hardscaping and street-side amenities shall require approval from the Planning Systems Department.

7-207 GENERAL IRRIGATION REQUIREMENTS

7-208 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

7-209 SUMMARY

- A. This Section includes piping, sprinklers, specialties, and accessories for extending existing shrubbery irrigation systems.

- B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 2 Section "Water Systems" for water supply.
2. Division 16 Sections for electrical power materials and installations.

7-210 DEFINITIONS

- A. Pipe sizes used in this Section are nominal pipe size (NPS) in inches. Tube sizes are Standard size in inches.
- B. Circuit Piping: Piping downstream from control valves to irrigation system sprinklers, emitters, devices, and drain valves. Piping is under pressure (less than pressure piping) during flow.
- B. Pressure Piping: Piping downstream from supply piping to and including control valves. Piping is under irrigation system pressure. Piping in this category includes pressure regulators, water meters, and backflow preventors, when used.
- C. Control Valve: Manual or automatic (electrically operated) valve for control water flow to irrigation system zone.

- D. Drain Piping: Downstream from circuit piping drain valves. Piping is not under pressure.
- E. Flush Valve: Per dirty water application.

7-211 SYSTEM PERFORMANCE REQUIREMENTS

- A. Location of Sprinklers and Devices: Design location is approximate. Make minor adjustments necessary to avoid plantings and obstructions such as signs and light standards.
- B. Minimum Water Coverage: Not less than:
 - 1. Other Planting Areas: 100 percent emitter coverage.
- C. Components and Installation: Materials should be capable of producing piping systems with the following minimum working pressure ratings except where indicated otherwise.
 - 1. Circuit and Drain Piping: 125 psig.

7-212 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

7-213 SUBMITTAL REQUIREMENTS

- A. Material List
 - 1. Furnish the articles, equipment, materials, or processes specified by name in the drawings and specifications. No substitution will be allowed without prior written approval by the Owner's Representative from City staff.
 - 2. Complete material list shall be submitted prior to performing any work. Material list shall include the manufacturer, model number and description of all materials and equipment to be used.
 - 3. Equipment or materials installed or furnished without Prior approval of the Owner's Representative from Community Maintenance and Recreation may be rejected and the Contractor required to remove such materials from the site at his own expense.
 - 4. Approval of any item, alternate or substitute indicates only that the product or products apparently meet the requirements of the drawings and specifications on the basis of the information or samples submitted.
- B. Record Drawings
 - 1. The Contractor shall dimension from two permanent points of reference, building corners, sidewalk or road intersections, etc., the location of the following items:
 - a) connection to existing water lines.
 - b) connection to existing electrical power.
 - c) gate valves.
 - d) routing of sprinkler pressure lines (dimension maximum 100' along routing).
 - e) sprinkler control valves.
 - f) routing of control wiring.
 - g) quick-coupling valves.
 - h) other related equipment as directed by the Owner's Representative.

7-214 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Handling of PVC Pipe and Fittings: THE CONTRACTOR shall store in covered areas – not exposed to outside elements, and is cautioned to exercise care in handling, loading, unloading, and storing of PVC pipe and fittings. All PVC pipe shall be transported in a vehicle which allows the length of pipe to lie flat so as not to subject it to undue bending or concentrated external load at any point. Any section of pipe that has been dented or damaged will be discarded and, if installed, shall be replaced with piping.

7-215 GUARANTEE

- A. The guarantee for the sprinkler irrigation shall be made in accordance with FIGURE 7.2-2. A copy of the guarantee form shall be included in the operations and maintenance manual. The guarantee form shall be retyped onto the Contractor's letterhead and contain the following information:

| | |
|--|-----------------------------|
| GUARANTEE FOR SPRINKLER IRRIGATION SYSTEM | |
| <p>We hereby guarantee that the sprinkler irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and specifications, ordinary wear and tear and unusual abuse or neglect expected. We agree to repair or replace any defects in material or workmanship which may develop during the period of two years from conclusion of maintenance period and also to repair or replace any damage resulting from the repairing or replacing of such defects at no additional cost to the Owner. We shall make such repairs or replacements within 10 working days, as determined by the Owner, after receipt of written notice. In the event of our failure to make such repairs or replacements within specified time after receipt of written notice from the Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand.</p> | |
| PROJECT: _____ | |
| LOCATION: _____ | |
| | SIGNED: _____ Contractor |
| | ADDRESS: _____ |
| | PHONE: _____ |
| | DATE OF ACCEPTANCE: _____ |

FIGURE 7.2-2

7-216 QUALITY ASSURANCE

- A. Comply with requirements of utility supplying water for prevention of backflow and backsiphonage.
- B. Comply with requirements of authority with jurisdiction for irrigation systems.
- C. Installer Qualifications: Engage an experienced Installer who has completed irrigation systems similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.

- D. Listing/Approval Stamp, Label, or Other Marking: On equipment, specialties, and accessories made to specified standards.
- E. Listing and Labeling: Equipment, specialties, and accessories that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in "National Electrical Code," Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- F. Product Options: Irrigation system piping, specialties, and accessories are based on specific types, manufacturers, and models indicated. Components with equal performance characteristics produced by other manufacturers may be considered, provided deviations in dimensions, operation, and other characteristics do not change design concept or intended performance as judged by the Owner's Representative in Community Maintenance and Recreation. The burden of proof of product equality is on the Contractor. Refer to Division 1 Section "Product Substitutions."

7-217 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Verify that irrigation system piping may be installed in compliance with original design and referenced standards.
- B. Site Information: Reports on subsurface condition investigations made during design of the Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions (between soil borings). **Owner assumes no responsibility for interpretations or conclusions drawn from this information.**

7-218 SEQUENCING AND SCHEDULING

- A. Maintain uninterrupted water service to building during normal working hours. Arrange for temporary water shutoff with Owner.
- B. Coordinate irrigation systems work with landscape work specified in Division 2 Section "Landscape Work."

7-219 EXTRA MATERIALS

- A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below. Package them with protective covering for storage and label clearly describing contents.
 - 1. Quick Couplers: Furnish one unit of each size installed.
 - 2. Sprinklers: Furnish quantity of units equal to 10 percent of amount of each type installed.
 - 3. Emitters, Drip Tube, and Devices: Furnish quantity of units equal to 10 percent of amount of each type installed.
 - 4. Valve Keys: Furnish one unit of each type key-operated, control valve installed.
 - 5. Quick-Coupler Hose Swivels: Furnish quantity of units equal to 25 percent of amount of each type quick coupler installed.
 - 6. Quick-Coupler Operating Keys: Furnish quantity of units equal to 25 percent of amount of each type quick coupler installed.

7-220 IRRIGATION MATERIALS SELECTION

- A. General: Use only new materials of brands and types noted on drawings, specified herein, or approval equals.
- B. PVC Pressure Mainline Pipe and Fittings:
 - 1. Pressure mainline piping shall be PVC Schedule 40.
 - 2. Pipe shall be made from NSF approved Type I, Grade I PVC compound conforming to ASTM specification D 2241. Piping 3" and under shall be SDR solvent weld. Piping over 3" shall be gasketed with ductile iron mechanical joints on ells and tees.
 - 3. PVC solvent-weld fittings shall be Schedule 80, 1-2, II-I NSF approved conforming to ASTM test procedure D2467.
 - 4. Solvent cement for PVC solvent-weld pipe and fittings shall be as manufactured by "Oatey" or equal Type 721.
 - 5. Solvent primer for PVC solvent weld pipes and fittings shall be "all purpose primer" (purple) for PVC and PVC pipe and fittings.
 - 6. Installation methods of solvent cement and primer for PVC solvent-weld pipe and fittings shall be as prescribed by the manufacturer.
 - 7. All PVC pipe shall bear the following markings:
 - a) manufacturer's name.
 - b) nominal pipe size.
 - c) schedule or class.
 - d) pressure rating in psi.
 - e) National Sanitation Foundation (NSF) approval.
 - f) date of extrusion.
 - 8. All fittings shall bear the manufacturer's name or trademark, material designation, size, applicable IPS schedule and NSF seal of approval.
- C. PVC Non-Pressure Lateral Line Piping (Including Emitter Lateral Piping)
 - 1. Non-pressure buried lateral line piping shall be PVC Class 200 solvent-weld joints for sizes 3/4 and larger. Pipe size 1/2" shall be Class 315.
 - 2. Pipe shall be made from NSF approved, Type I, Grade II PVC compound conforming to ASTM resin specification D1784. All pipes shall meet requirements set forth in Federal Specification PS-22-70, with an appropriate standard dimension ratio.
 - 3. Except as noted in paragraphs 1 and 2 of Section 2.1.C, all requirements for non-pressure lateral line pipe and fittings shall be the same as for solvent-weld pressure mainline pipe and fittings as set forth in Section 2.1.B of these specifications.
- D. Brass Pipe and Fittings
 - 1. Where indicated on the drawings, use red brass screwed pipe conforming to Federal Specification #WW-P-351.
 - 2. Fittings shall be red brass conforming to Federal Specification #WW-P-460.
- E. Copper Pipe and Fittings (Any pipe exposed to element/above grade)
 - 1. Where indicated on drawings, use copper pipe conforming to all requirements of ASTM B-88 Type K.
 - 2. All copper pipe shall be new, seamless copper pipe designed for underground water service plumbing purposes, etc.
- F. Isolation Gate Valves:

1. Gate Valves 3 in. and Larger:

- a) shall be iron body, rubber encapsulated resilient wedge and shall conform to specification of American Water Works Association Standard C509.
- b) shall have two (2) inch square operating nut with arrow cast in metal indicating direction of opening.
- c) shall have ends compatible with pipe in which they are being installed.
- d) shall be similar to those manufactured by Waterous Valve Mfg. Co., or approved equal.

2. Other Gate Valves:

- a) gate valves 2-1/2" and smaller shall be 125-lb. SWP bronze gate valve with screw-in bonnet, non-rising stem and solid wedge disc.
- b) gate valves 2 1/2" and smaller shall have threaded ends and shall be equipped with a bronze handwheel.
- c) gate valves 2 1/2" and smaller shall be similar to those manufactured by Nibco or approved equal.
- d) all gate valves shall be installed per installation detail.

G. Quick-Coupling Valves: Quick-coupling valves shall have a brass two-piece body designed for working pressure of 150 psi operable with quick couples. Key size and type shall be 1" or #44.

H. Control Wiring:

- 1. Connections between the automatic controllers and the electric control valves shall be made with direct burial copper wire AWG-UF 600 volt. Pilot wires shall be a different color wire for each automatic controller. Common wires shall be white with a different color stripe for each automatic controller. Install in accordance with valve manufacturer's specifications and wire chart. In no case shall wire size be less than #14.
- 2. Wiring shall occupy the same trench and shall be installed along the same route as pressure supply or lateral lines wherever possible.
- 3. Where more than one wire is placed in a trench, the wiring shall be taped together in bundle at intervals of 10 feet.
- 4. An expansion curl shall be provided within three feet of each wire connection and each change direction of the main line. Expansion curl shall be of sufficient length at each splice connection at each electric control, so that in case of repair, the valve bonnet may be brought to the surface without disconnection of the control wires. Control wires shall be laid loosely in trench without stress or stretching of control wire conductors.
- 5. All splices shall be made with 2-piece Pentite with sealant. Grease filled splices are not allowed.
- 6. Field splices between the automatic controller and electrical control valves will not be allowed without prior approval of the Owner's representative from Community Maintenance and Recreation.
- 7. All control wire under paving or structures shall be sleeved in Schedule 40 PVC Pipe. Size as required or as shown on the drawings. Minimum size shall be 2".
- 8. Wire and pipe sleeve separately during installation.

I. Automatic Controllers:

- 1. The controller(s) shall be housed in lockable, weather-resistant case. The controller(s) shall be UL listed. The controller shall be pedestal mount.
- 2. Final location of automatic controllers shall be approved by the Owner's Representative from Community Maintenance and Recreation.

Controller manufacturer shall offer local authorized service for all components and electronics of the control equipment and make available an extended warranty package for a two-year period covering all parts and labor for annual budgetary purposes.

J. Electric Control Valves:

1. All electric control valves shall be 3 way solenoid contamination resistant valves, as indicated on drawings.
2. All electric control valves shall be compatible with the automatic controllers and unless otherwise specified shall be of the same manufacture.
3. All electric control valves shall have a manual flow adjustment.
4. Provide and install one control valve box for each electric control valve.
5. One valve per main line tap.

K. Control Valve Boxes:

1. Minimum size to be 16" x 12" x 12" outside dimension. Provide for all valves.
2. Provide extensions compatible with boxes as required to insure box rests on continuous soil base/fired brick. Provide valve box with red brick pavers at corner of each portion of the valve box.
3. Boxes shall be Carson T-type top or approved equal.
4. Provide 6" pea gravel sump below valve body.

L. Sprinkler Heads:

1. All sprinkler heads shall be of the same size, type, and deliver the same rate of precipitation with the diameter (or radius) of throw, pressure, and discharge as shown on the plans and/or specified in these special provisions.
2. Riser units shall be fabricated in accordance with the details.
3. Swing joints for all sprinkler heads shall be the same size as the riser opening in the sprinkler body.
4. All sprinkler heads of the same type shall be of the same manufacturer.
5. Pre-fabricated swing joints will not be allowed.

M. Detectable Tape:

1. Detectable tape shall consist of 0.35 mil thick solid foil core encased in a protective plastic jacket that is resistant to alkalis, acids and other destructive elements commonly found in soil. The lamination shall have sufficient strength that the layers cannot be separated by hand. The total composite thickness shall be 4.3 mils minimum. The foil core is to be visible to ensure continuity.
2. Detectable tape shall have a minimum tensile strength of 63 lbs. In the machine direction and 68 lbs. In the transverse direction per three inch strip.
3. A continuous warning message repeated every 16 to 36 inches should be imprinted on the tape surface. The tape shall be colored: designating the code appropriate to the type of line which the tape is protecting with name brand facing up to indicate location.
4. The tape shall be applied to all pressurized main lines – 4" above.

7-221 INSPECTION

A. Site Conditions:

1. All scaled dimensions are approximate. The Contractor shall check and verify all size dimensions and receive Owner's Representative from Community Maintenance and Recreation approval prior to proceeding with work under this Section.
2. Exercise extreme care in excavating and working near existing utilities. Contractor shall be responsible for damages to utilities, which are caused by his operation or neglect. Check existing utility drawings for existing utility locations.

3. Coordinate installation of sprinkler irrigation materials, including pipe, so there shall be no interference with utilities or other construction or difficulty in planting trees, shrubs, and ground covers.
4. That Contractor shall carefully check all grades to satisfy him that he may safely proceed before starting work on the sprinkler irrigation system.
5. No irrigation will be installed unless final grade is (+-) 1/10" above final grade.

7-222 PREPARATION

A. Physical Layout:

1. Prior to installation, the Contractor shall stake out all pressure supply lines, routing and location of sprinkler heads.
2. All layouts shall be approved by Owner's Representative from Community Maintenance and Recreation prior to installation. Call (480) 312-2722.

B. Water Supply:

1. Sprinkler irrigation system shall be connected to water supply points or connection as indicated on the drawings.
2. Connections shall be made at approximate locations as shown on drawings. Contractor is responsible for minor changes caused by actual site conditions.

C. Electrical Supply:

1. Electrical connections for automatic controller shall be made to electrical points of connection as indicated on the drawings.
2. Connections shall be made at approximate locations as shown on drawings. Contractor is responsible for minor changes caused by actual site conditions.

7-223 INSTALLATION

- A. Trenching. Before trenching the final grade is at (+-) 1/10". Dig trenches straight and support pipe continuously on bottom of trench. Lay pipe to an even grade. Trenching excavation shall follow layout indicated on drawings and as noted. If the bottom of a pipe trench excavation is found to consist of rock, caliche, or any other material that, by reason of its hardness, cannot be excavated to give a uniform bearing surface, said rock or other material shall be removed for at least three inches (3") below the specified trench depth, and be refilled to specified trench depth with sand or similar material thoroughly tamped into place. Trenches shall be of sufficient depth to provide minimum earth coverage from finish grade as follows:

1. Pressure mainline: 24 inches
2. Control wires: 24 inches
3. Lateral rotary sprinkler heads: 16 inches
4. Emitter, spray heads and bubbler laterals: 12 inches
5. Sleeves under vehicular paving: 24 inches
6. All other sleeves: 18 inches
7. Electrical conduit: 24 inches

B. Backfilling:

1. The trenches shall not be backfilled until all required tests are performed. Trenches shall be carefully backfilled in 6" lifts with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand, or other approved materials, free from large clods of earth or stones. Backfill shall be mechanically compacted in landscaped areas to a dry density equal to adjacent undisturbed soil in planting

areas. Backfill will conform to adjacent grades without dips, sunken areas, humps or other surface irregularities.

2. A fine granular material backfill will be initially placed on all lines to a depth of 3" over the top of the pipe. No foreign matter larger than 1/2" in size will be permitted in the initial backfill on top pipe.
3. All trenches will be water settled. Flooding of trenches will be permitted only with approval of the Owner's Representative from Community Maintenance and Recreation.
4. If settlement occurs and subsequent adjustments in pipe, valves, sprinkler heads, lawn or planting, or other construction are necessary, the Contractor shall make all required adjustments without cost to the Owner.

C. Trenching and Backfill Under Paving:

1. Trenches located under areas where paving, asphaltic concrete or concrete will be installed shall be backfilled with sand (a layer six inches below the pipe and three inches above the pipe) and compacted in layers using manual or mechanical tamping devices. Trenches for piping shall be compacted to equal the compaction of the existing adjacent undisturbed soil and shall be left in a firm unyielding condition. All trenches shall be left flush with the adjoining grade. The sprinkler irrigation Contractor shall set in place, cap and pressure test all piping under paving prior to the paving work.
2. Compaction percentage of backfill material shall be based on recommendations of the Soils Report. If Soils Report is not available, compaction shall be based on MAG Section 601.
3. Generally, piping under existing walks is done by jacking, boring or hydraulic driving, but where any cutting or breaking of existing sidewalks and/or concrete is necessary, it shall be done and replaced by the Contractor as part of the contract cost. Permission to cut or break sidewalks and/or concrete shall be obtained from the Owner's Representative. Hydraulic driving will be permitted under concrete paving provided an 18" minimum depth is maintained.
4. Provide for a minimum cover of 24" between the top of the pipe and the bottom of the aggregate base for all pressure and non-pressure piping installed under asphaltic concrete paving.
5. Provide Schedule 40 PVC sleeves for all piping under paving. Sleeve shall be 2 times the diameter of the pipe being sleeved. Provide one sleeve per pipe.

D. Assemblies:

1. Routing of sprinkler irrigation lines as indicated on the drawings is diagrammatic. Install lines and various assemblies to conform to the details shown on drawings and in accordance with the manufacturer's recommendations.
2. Install no multiple assemblies on plastic lines. Provide each assembly with its own outlet.
3. Install all assemblies specified herein in accordance with respective detail. In absence of detail drawings or specifications pertaining to specific items required to complete work, perform such work in accordance with best standard practice with prior approval of Owner's Representative from Community Maintenance and Recreation.
4. PVC pipe and fittings shall be thoroughly cleaned of dirt, dust and moisture before installation. Installation and solvent-welding methods shall be as recommended by the pipe and fitting manufacturer. Primer shall be used on all solvent weld joints.
5. On PVC to metal connections, the Contractor shall work the metal connections first. Teflon tape on all threaded PVC-to-metal joints. Light wrench pressure is all that is required. Where threaded PVC connections are required, use threaded Schedule 80 tee with Schedule 40 coupling into which the pipe may be welded. PVC male adapters will not be allowed.
6. Thrust Blocks: Concrete thrust blocks shall be installed at all end plugs, ells and tees in main lines.

- E. Line clearance. All lines shall have a minimum clearance of 12 inches from lines of other trades. Parallel lines shall not be installed directly over one another and shall have enough distance to facilitate bedding and compaction.
- F. Automatic controller. Install as per manufacturer's instructions. Remote control valves shall be connected to controller in numerical sequence as shown on the drawings. Controller station valve/schedule assignments shall be approved by the owner's representative from Community Maintenance and Recreation. The controller shall be grounded with an 8' x 5/8" copper clad ground rod located as close as practical to the controller and connected with #10 wire minimum. Approved clamps shall be used. One ground rod per controller approved by Community Maintenance and Recreation.
- G. High-voltage Wiring for Automatic Controller
 - 1. 120 -volt power connection to the automatic controller shall be provided by the Irrigation Contractor.
 - 2. All electrical work shall conform to local codes, ordinances, and governing authorities having jurisdiction.
- H. Remote control valves. Install where shown on drawings and details. When grouped together, allow at least 12" between valves. Install each remote control valve in a separate valve box. Locate adjacent to walks or curbs where possible. Identify each valve with a permanent marker, tied to stem, with controller and station identification marked. Provide one mainline tap for each lateral line valve.
- I. Flushing of System:
 - 1. After all new sprinkler pipe lines and risers and emitters are in place and connected, all necessary diversion work has been completed, and prior to installation of sprinkler heads, the control valves shall be opened and a full head of water used to flush out the system.
 - 2. Sprinkler heads shall be installed only after flushing of the system has been accomplished to the complete satisfaction of the Owner's Representative from Community Maintenance and Recreation.
- J. Sprinkler Heads:
 - 1. Install the sprinkler heads as designated on the drawings. Sprinkler heads to be installed in this work shall be as shown on the drawings.
 - 2. Spacing of heads shall not exceed the maximum indicated on the drawings. In no case shall the spacing exceed the maximum recommended by the manufacturer.
 - 3. Ensure 100% coverage.

7-224 TEMPORARY REPAIRS

- A. The Owner reserves the right to make temporary repairs as necessary to keep the sprinkler system equipment in operating condition. The exercise of this right by the Owner shall not relieve the Contractor of his responsibilities under the terms of the guarantee as herein specified.

7-225 EXISTING TREES

- A. Where it is necessary to excavate adjacent to existing trees, the Contractor shall use all possible care to avoid injury to trees and tree roots. Excavation in areas where two-inch and larger roots occur shall be done by hand. All roots two inches and larger in diameter, except directly in the path of pipe or conduit, shall be tunneled under and shall be heavily wrapped with burlap to prevent scarring or excessive drying. Where a ditching machine is run close to trees having roots smaller than two inches in diameter, the wall of the trench adjacent to the tree shall be hand trimmed, making clean cuts

through. Roots one inch and larger in diameter shall be painted with two coats of Omni/Soil Sulfur or equal. Trenches adjacent to trees should be closed within 24 hours, and where this is not possible, the side of the trench adjacent to the tree shall be kept shaded with burlap or canvas.

7-226 FIELD QUALITY CONTROL

A. Adjustment of the System:

1. The Contractor shall flush and adjust all sprinkler heads for optimum performance and to prevent overspray onto walks, roadways, and buildings as much as possible.
2. If it is determined that adjustments in the irrigation equipment will provide proper and more adequate coverage, the Contractor shall make such adjustments prior to planting. Adjustments may also include changes in nozzle sizes and degrees of arc as required. Such changes shall be approved in advance by the Owner's Representative from Community Maintenance and Recreation.
3. Lowering raised sprinkler heads by the Contractor shall be accomplished within 10 days after notification by Owner Representative from Community Maintenance and Recreation.
4. All sprinkler heads shall be set perpendicular to finished grades unless otherwise designated on the plans. On slopes, heads shall be angled for optimum coverage.
5. Owner's Representative from Community Maintenance and Recreation to approve all head locations and reserves the right to request Contractor to make minor adjustments to head or emitter placement or nozzle selection at no cost to the Owner.

B. Testing of Irrigation System:

1. The Contractor shall request the presence of the Owner's Representative from Community Maintenance and Recreation at least 48 hours in advance of testing. Call (480) 312-2722.
2. Test all pressure lines under hydrostatic pressure of 150 lbs./sq. in. and prove watertight. **NOTE:** Testing of pressure main lines shall occur prior to installation of electric control valves.
3. All piping under paved areas shall be tested under hydrostatic pressure of 150 lbs./sq. in. and proved watertight prior to paving.
4. Sustain pressure in lines for not less than two hours. Pipe sections shall be center loaded and all couplings shall be exposed. Before testing, the line shall have been filled with water for at least four (4) hours and provisions made for thoroughly bleeding the line of air.
5. All hydrostatic tests shall be made only in the presence of the Owner's Representative from Community Maintenance and Recreation. No pipe shall be backfilled until it has been inspected, tested and approved in writing.
6. Furnish necessary force pump and all other test equipment.
7. When the sprinkler irrigation system is completed, perform a coverage test in the presence of the Owner's Representative from Community Maintenance and Recreation to determine if the water coverage for planting areas is complete and adequate. Furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from plans or where the system has been willfully installed as indicated on the drawings when it is obviously inadequate without bringing this to the attention of the Owner's Representative from Community Maintenance and Recreation. This test shall be accomplished before any ground cover is planted.
8. Upon completion of each phase of work, the entire system shall be tested and adjusted to meet site requirements.

7-227 MAINTENANCE

- A. The entire sprinkler irrigation system shall be under full automatic operation for a period of seven days with all malfunctions and leaks corrected prior to any planting.
- B. The Owner's Representative from Community Maintenance and Recreation reserves the right to waive or shorten the operation period.

7-228 CLEANUP

- A. Cleanup shall be made as each portion of work progresses. Refuse and excess dirt shall be removed from the site, all walks and paving shall be broom finished or washed down, and any damage sustained on the work of others shall be repaired to the original conditions acceptable to the Owner's Representative from Community Maintenance and Recreation.

7-229 FINAL OBSERVATION PRIOR TO ACCEPTANCE

- A. The Contractor shall operate each system in its entirety for the Owner's Representative from Community Maintenance and Recreation at the time of final observation. Any items deemed not acceptable shall be reworked to the complete satisfaction of the Owner's Representative.
- B. The contractor shall show evidence to the Owner's Representative from Community Maintenance and Recreation that the Owner has received all accessories, charts, record drawings, and equipment as required before final observation can occur.

7-230 OBSERVATION SCHEDULE

- A. Contractor shall be responsible for notifying the Owner's Representative from Community Maintenance and Recreation in advance for the following observations according to the time indicated:
 - 1. Pre-job conference – Seven (7) days.
 - 2. Pressure supply line installation and testing – 48 hours.
 - 3. Automatic controller installation – 48 hours.
 - 4. Control wire installation – 48 hours.
 - 5. Lateral line and sprinkler installation – 48 hours.
 - 6. Coverage test – 48 hours.
 - 7. Final observation – Seven (7) days.
 - 8. Emitter lateral and extension line placement – 48 hours.
 - 9. Emitter operation – 48 hours.
- B. When inspections have been conducted by other than the Owner's Representative from Community Maintenance and Recreation, show evidence **in writing** of when and by whom these inspections were made.

7-231 NON CONFORMANCE

Designs that do not conform to the criteria set forth in this publication may be appealed in writing to the Development Review Board. The approval, with or without conditions, or denial by the Development Review Board of an application shall be final unless within twenty (20) days from the date of the Board's decision, the applicant shall appeal therefrom in writing to the Scottsdale City Council. Such appeal shall be submitted through the City Clerk and shall indicate where, in the opinion of the appellant, the Board was in error. The City Clerk shall schedule the appeal for a City Council agenda, and the City Council at its meeting, shall uphold, modify, or overrule the decision of the Board. The decision of the City Council shall be final.

Section 7.3

Non-Paved Trails Design Standards and Policies Revised December 1999

Chapter 7 Landscaping

SECTION 7.3

NON-PAVED TRAILS

PAGE INDEX

| <u>SECTION</u> | <u>PARAGRAPH TITLE</u> | <u>PAGE</u> |
|-----------------------|--|--------------------|
| 7-301 | Introduction A. Preface B. References C. Purpose of Design Standards and Policies D. City Goal E. City Trails Plans F. Trail Classifications G. Definitions | 1 |
| 7-302 | Trail Design A. Design Objectives B. Design Considerations C. Trail Location | 5 |
| 7-303 | Specifications for Trail Classifications A. Urban Trails B. Rural Trails C. Backcountry Primary Trails D. Backcountry Secondary Trails E. Interpretive Trails F. Barrier Free Trails | 10 |
| 7-304 | Trail Construction A. Tread Construction B. Vegetation Clearance C. Surface Water Control D. Special Structures E. Road Crossings F. Trail Access Facilities | 17 |
| 7-305 | Trail Signs and Markers A. Location B. City of Scottsdale Sign Standard C. Developer Provided Sign Standard | 27 |
| 7-306 | Trail Maintenance A. Slough and Berm Removal B. Vegetation Clearance C. Tread Maintenance D. Drainage Maintenance E. Special Structure Maintenance F. Trail Sign Maintenance | 29 |

FIGURE LIST

| <u>FIGURE</u> | <u>DESCRIPTION</u> |
|----------------------|--------------------------------------|
| 7.3-1 | Cross Slopes |
| 7.3-2 | Typical Trail Profile |
| 7.3-3 | Typical Trail Cross Sections |
| 7.3-4 | Vegetation Clearance |
| 7.3-5 | Grade Dips |
| 7.3-6 | Rock Waterbar |
| 7.3-7 | Log Waterbar |
| 7.3-8 | Rock Culvert |
| 7.3-9 | Pipe Culvert |
| 7.3-10 | Rock Retaining Wall |
| 7.3-11 | Rip Rap |
| 7.3-12 | Wash Crossing |
| 7.3-13 | Switchback and Climbing Turn Concept |
| 7.3-14 | Switchback Turn |
| 7.3-15 | Climbing Turn |
| 7.3-16 | Rock Steps |
| 7.3-17 | Safety Barriers |
| 7.3-18 | Trail Access Gates |
| 7.3-19 | Trail Junctions |
| 7.3-20 | Trail Overpass and Bridge |
| 7.3-21 | Trail Underpass |
| 7.3-22 | Trail Access Facility Concept |
| 7.3-23 | Trail Sign |
| 7.3-24 | Trail Signs |
| 7.3-25 | Trail Sign Installation |
| 7.3-26 | Slough and Berm Removal |



SECTION 7.3

Non-PAVED TRAILS

7-301 INTRODUCTION

A. Preface

This manual addresses the planning, design, maintenance, and construction of trails within the City of Scottsdale. The "trails" addressed in this manual are non-paved, non-motorized, shared-use trails, which are legally accessible by the general public.

B. References

The following publications were referenced during the preparation of this Manual:

Conflict on Multiple Use Trails, Roger L. Moore, North Carolina State University, 1994.

DRAFT Trail Design, Construction, and Maintenance Guidelines, Arizona State Parks, State Trails Program, 1993.

NPS Trails Management Handbook, U.S.D.I. National Park Service, 1983.

Trail Construction and Maintenance Notebook, U.S.D.A. Forest Service, 1996.

Trails for the 21st Century, Rails to Trails Conservancy, 1993.

Trails Management Manual, Maricopa County Recreation Services Department, 1995.

C. Purpose of Design Standards and Policies

The information in this manual will provide direction for the planning, design, maintenance, and construction of trails within the City of Scottsdale. Any divergence from these design standards and policies is subject to approval by the City of Scottsdale Trails Coordinator and other appropriate City representatives.

D. City's Goal

The City of Scottsdale's goal is to develop and maintain a city-wide interconnecting network of trails to provide valuable recreation and transportation opportunities for City residents and visitors. Trails function as transportation links between schools, residential areas, parks, places of employment, shopping areas, and other areas of

interest. Trails also provide hikers, walkers, joggers, equestrians, mountain bicyclists, and people with disabilities opportunities to improve health and fitness, spend time with family and friends, enjoy the natural environment, and escape the stress of everyday life.

E. City Trails Plans

There are multiple trails plans that must be consulted for the identification of trail alignments within the City. The "Circulation Element" of the City's General Plan provides a basis for the identification of trail locations City-wide. More detailed plans also exist that provide guidance for the development of trails specifically within the McDowell Sonoran Preserve. The planning of trails within the Preserve is the responsibility of the City's Preserve Division, the Preserve Planning Committee, and the Preserve Commission. The planning of trails outside of the Preserve is the responsibility of the City's Community Maintenance and Recreation Division and the Parks and Recreation Commission. It is understood that these various entities shall coordinate together to create the most functional City-wide trail system possible.

F. Trail Classifications (See Section 7-303 for specifications on each trail classification)

1. Urban Trails

The management objective for Urban trails is to provide both transportation and recreation links between residential areas, schools, businesses, parks, places of employment, and other areas of significant community activity. User groups include hikers, equestrians, and bicyclists. Motorized vehicles are only permitted for maintenance and emergency purposes. The trail surface may be comprised of either native soil or decomposed granite. Urban trails have the greatest width of all trail classifications thus accommodate leisurely side-by-side travel and easy passing for multiple user types. These trails are typically located within areas of relatively level topography.

2. Rural Trails

The management objective for Rural trails is to provide secondary transportation and recreation links through areas such as washes, scenic and vista corridors, and other desert open space areas. Secondary networks of neighborhood trails, such as those dedicated to the City but not shown on the General Plan, are classified as Rural trails. User groups include hikers, equestrians, and bicyclists. Motorized vehicles are only permitted for maintenance and emergency purposes, and where trail widths allow. Rural trails are more narrow than Urban trails, therefore occasional single file travel by users may be required. These trails are typically located within areas of level to moderate topography.

3. Backcountry Primary Trails

The management objective for Backcountry Primary trails is to provide safe and enjoyable trail recreation opportunities within preserved open space areas of the City, while having a minimum impact on the surrounding environment. These trails typically provide connections between major trail access points and Backcountry Secondary trails. User groups include hikers, equestrians, and bicyclists. Certain user groups may be prohibited if deemed appropriate (see section 7-302.B.8S). Motorized vehicles with a wheel base of less than 48" may be used for

maintenance and emergency purposes only. These trails are typically located within areas of moderate to slightly more rugged topography. The installation of erosion control structures may be necessary along trail sections with steeper longitudinal slopes. Trail widths may occasionally be too narrow to allow side-by-side travel by users.

4. Backcountry Secondary Trails

The management objective for Backcountry Secondary trails is to provide safe and enjoyable trail recreation opportunities within preserved open space areas of the City, while having a minimum impact on the surrounding environment. These trails typically serve as secondary routes emanating as spurs from Backcountry Primary trails. User groups are all non-motorized, including hikers, equestrians, and bicyclists. Certain user groups may be prohibited if deemed appropriate (see section 7-302.B.8). Motorized vehicles may not be used for maintenance or emergency purposes due to the narrow tread width. Backcountry Secondary trails traverse areas with rugged topography, therefore longitudinal grades are steeper, more difficult, and require erosion control structures. The trail tread is more narrow than Backcountry Primary trails, thus requiring single file travel by users.

5. Interpretive Trails

The management objective for Interpretive trails is to provide educational opportunities along a common theme. Education and interpretation can occur in a variety of forms including, but not limited to, signage and brochures. Use by equestrians and bicyclists is prohibited. Motorized vehicles are only permitted for maintenance and emergency purposes, and where trail widths allow. These trails generally occur in areas of gentle topography, therefore longitudinal grades are easy to moderate. The trail tread should be wide enough to accommodate some side-by-side travel and two-way traffic. Barrier-Free standards may be achieved with additional improvements.

6. Barrier-Free Trails

The management objective of Barrier-Free trails is to provide trail opportunities for persons with physical disabilities including mobility, visual, and hearing impairments. The design of Barrier-Free trails should provide access to viewpoints, activity areas, and other points of interest, and should meet the standards of the Americans with Disabilities Act (ADA). Equestrians and bicyclists are not permitted on Barrier-Free trails. Motorized vehicles (excluding electric wheelchairs and other types of mobility aids) are permitted only for maintenance and emergency purposes. Caution must be exercised when using vehicles to avoid damaging hardened surfaces. These trails generally occur in areas that are flat with very gentle topography and level longitudinal grades. The trail tread is wide enough to accommodate side-by-side travel and two-way traffic, and is composed of a hardened or stabilized surface.

G. Definitions

1. Backslope - The cut bank formed by the excavation of material on the uphill side of the trail tread.

2. Batter - The amount that a retaining wall leans into a hillside, usually expressed by ratio.
3. Bench - The terrace formed when a hillside is excavated for the purpose of constructing a trail.
4. Berm - A ridge of material formed on the outer edge of the trail tread that is greater in height than the center of the trail tread.
5. Cairn - Constructed mound of rock located adjacent to a trail. Used where the trail tread is indistinct.
6. Climbing Turn - A section of trail which reverses the direction of travel while gaining elevation. The longitudinal slope of the trail is maintained through the turn.
7. Clinometer - Instrument used for measuring angles of elevation or inclination.
8. Cross Slope – The slope of the trail surface perpendicular to the center line, expressed as a percent or a ratio.
9. Culvert - Drainage structure constructed of rock or pipe that allows water to flow under the trail without causing erosion.
10. Fillslope - Material added to the downhill edge of the trail tread. This material is often removed as part of the backslope or is derived from nearby borrow pits.
11. Grade, Maximum - The steepest grade permitted on any segment of the trail, not to exceed a distance specified for the particular trail classification.
12. Grade, Sustained - The steepest grade permitted over the majority of the trail length.
13. Grade Dip (also known as “Drain Dip”) - Short segment of trail with a grade opposite of the prevailing grade designed to route surface water off the trail. The lowest point of the dip is outsloped to assure the surface water is routed off the side of the trail.
14. Header Stone - A long uniform stone laid with its end towards the face of a retaining wall or crib used intermittently to structurally tie in the other rocks laid in the wall.
15. Inslope - Where the trail surface slopes downward from the outside (downhill) to the inside (uphill) edge of the trail. Insloping must be accompanied by a rock-lined swale between the inside edge of the trail and the backslope.
16. Longitudinal Slope - The slope of a trail along the centerline, expressed as a percentage or a ratio.
17. Outslope - Where the trail surface slopes downward from the inside (uphill) to the outside (downhill) edge of the trail.

18. Shared-Use Trail – A natural surfaced trail which is collectively shared by a range of users including, but not limited to, equestrians, walkers, bicyclists, hikers, and joggers.
19. Sideslope - The natural slope of the ground measured at right angles to the centerline of the trail.
20. Slough (pronounced “sluff”) - Material that has moved downhill from the backslope onto the inside (uphill) edge of the trail.
21. Swale - A constructed watercourse that channels water away from the trail. Typically lined with rocks to reduce erosion.
22. Switchback - A sharp short radius curve in a trail that is used on hillsides to reverse the direction of travel and to gain elevation. Switchbacks have relatively level turning platforms.
23. Trailhead - The beginning or ending access point to a trail, often accompanied by various trail support facilities such as horse trailer and regular vehicle parking spaces, hitching rails, corrals, bike racks, shade ramadas, picnic tables, drinking fountains, water troughs, restrooms, directional and informational signing, and entrance gates.
24. Tread - The surface of the trail upon which trail users travel.
25. Turnout - Short section of widened trail that provides safer passage of trail users. Helpful when visibility along the trail is limited.
26. Wash - A natural watercourse, wet or dry.
27. Waterbar - Drainage structures constructed of rock or logs embedded in the trail surface at a 45 degree angle to the direction of travel for the purpose of directing surface water off the trail.

7-302 TRAIL DESIGN

A. Design Objectives

The City’s objective is to design, construct, and maintain trails that:

- provide safe non-motorized transportation links and/or close-to-home recreation opportunities,
- provide legal public access to destination points and other areas of interest,
- blend with the surrounding environment,
- minimize impacts on the natural environment,
- minimize impacts on adjacent landowners, and
- require minimum levels of maintenance.

B. Design Considerations

1. Human Factors

Trails must be planned and constructed with the needs of the trail user in mind. Trail users tend to desire routes that access and connect areas of significant community activity such as schools, businesses, shopping areas, and parks, as well as other areas of interest such as viewpoints, water sources, natural areas, desert preserves, scenic and vista corridors, and interesting geologic features. Visual qualities are important to trail users, therefore, trails should be designed to blend with the surrounding environment. Views from the trail to the surrounding environment should also be considered. Trail users enjoy changes in scenery, thus increasing the demand for loop trails and trail networks that allow the user to return to the starting point without traveling the same trail twice. Loop trails also provide the comfort of knowing that the trail will bring them back to the starting point, thus reducing the chance of becoming lost. Trail users tend to favor the easiest, most obvious route. If the designated trail is not the easiest, most obvious route, trail users will begin to create new, unauthorized trails.

2. Coinciding Easements

Trails are frequently located within common tracts and easements dedicated for other purposes such as drainage, flood control, public utility, natural area open space, and scenic and vista corridors. In situations where these common tracts and easements are wider than that needed for a trail easement, it may be advantageous to dedicate the same area of these coinciding common tracts and easements for the purposes of public trail use. This will increase the flexibility to properly lay out, design, and construct public trails, and will allow the trail to be positioned away from undesirable areas such as low-flow wash channels, areas of extreme topography, dense vegetation, critical animal habitats, and adjacent properties. This will also allow future realignment of the trail, should such a realignment become necessary. In cases where a separate trail easement is delineated within other easements or common tracts, it is extremely important that the alignment of the trail easement be reviewed on the ground to assure suitability.

3. Adjacent Landowner Privacy

The privacy of landowners adjacent to trails and trail access facilities is an important design concern. Privacy can be maintained or improved by modifying the trail alignment, planting landscape buffers, installing walls, allowing grade separations, or using a combination of these methods.

4. Trail Viewshed

The line of sight from a trail to the surrounding landscape, and from the surrounding landscape to a trail are important design considerations. Views from the trail to the surrounding landscape improve the quality of the trail users' experience, therefore, trails should be designed to provide users varying views of the surrounding area. Obscuring views of the trail from the surrounding landscape is important to adjacent landowners who may not want to view of the trail from their property.

5. Native Plants

The design, construction, and maintenance of trails within the City of Scottsdale shall take into account the City of Scottsdale Native Plant Ordinance (Section 7.500 of the City's Zoning Ordinance). Trails shall be aligned to avoid disturbance of, and have a minimum effect on the following plant species: whitethorn acacia, catclaw acacia, crucifixion thorn, hackberry, blue palo verde, foothill palo verde, desert willow, juniper, ironwood, cottonwood, mesquite, scrub oak, sugar sumac, arizona rosewood, saguaro, barrel cacti, ocotillo, and soaptree yucca.

6. Sensitive Wildlife Habitat

Trail design and construction within natural desert park and preserve areas should be evaluated in terms of the effect that the trail will have on sensitive wildlife habitats. The Arizona Game and Fish Department should be consulted during the trail design process to assure that the trail will not have a negative impact on such resources. The best means of preventing negative impacts on wildlife is to simply avoid sensitive areas. Seasonal trail closures may be necessary in some situations.

7. Archaeological and Cultural Resources

Trail design and construction should be evaluated in terms of the effect the trail will have on archaeological and cultural resources. Such activities shall be done in accordance with the City of Scottsdale Archeological Ordinance.

Potential options to prevent and mitigate damage to these resources include:

- Altering the trail alignment to avoid archaeological and cultural resources.
- Protecting the resources by utilizing methods to obscure them from view.
- Mitigating the cultural resource which involves removal and thorough documentation of the items by a professional archaeologist. The documentation of the resource may then be interpreted as part of the trail opportunity.

8. Design for Shared-Use

Trails within the City of Scottsdale are open to all non-motorized uses unless otherwise stated. Decisions to prohibit any non-motorized use from City of Scottsdale trails must be based on coordinated planning efforts involving appropriate user groups and City staff. Characteristics that should be considered as part of this process include, but are not limited to, longitudinal and cross slopes, surface materials, line of sight, amount of use, sensitivity of surrounding environment, soil types, and native plant and animal habitats.

The following means of preventing potential user conflicts are based on methods identified in "Conflict on Multiple Use Trails" (Moore, 1994), and should be considered when planning, designing, constructing, and maintaining shared-use trails:

- Separate user types at trailheads and along the first, most crowded, stretches of trail.
- Provide adequate sight distances.
- Build trails wide enough to accommodate expected levels and types of use.
- Build and maintain trails wide enough for safe passing and/or provide periodic turnouts
- Design trails to control speeds where necessary by varying the trail surface and avoiding long, straight downhill stretches.
- Provide adequate trailhead facilities for all user types.

C. Trail Location

The following process identified in the “Trails Management Manual” (Maricopa County Recreation Services Department, 1995) has been proven effective, and shall serve as a guide for trail design and layout within the City of Scottsdale.

Location work must begin early in the trail design process and be completed prior to construction. The amount and level of work that is required varies depending on the type of trail being designed and the terrain on which the trail is being constructed. The necessary steps to properly layout the trail do not change. They are as follows:

1. Reconnaissance

The reconnaissance process includes the identification and evaluation of alternative routes and leads to final selection of the best possible route to meet the established objectives. Application of sound principles of trail location, alignment, and grade will minimize future operation and maintenance problems.

The first step is to examine the most recent topographic maps and aerial photos of the area to identify significant landforms, drainage patterns, and vegetation. The next step, for which there is no substitute, is to walk the area and examine potential routes. Conduct a systematic study of the area by walking various routes and viewing the area from different vantage points. Control points, which are features that are favorable for or inhibit trail construction, should be identified through this process. The control points will help to identify the best possible route, with the understanding that situations may exist where trails must pass through negative control points.

Control points which are favorable for trail construction are:

- Existing road crossings such as underpasses, overpasses, and intersections with traffic lights or stop signs
- Natural wash crossings
- Ridgelines
- Hillside benches
- Areas of light vegetation
- Scenic vistas

- Areas of well drained soils
- Good trailhead access

Control points which inhibit trail construction and should be avoided are:

- Wet areas and poorly drained flat areas
- Sensitive wildlife habitats
- Wash bottoms
- Areas adjacent to sources of excessive noise such as airports
- Areas adjacent to plants that are poisonous to horses such as oleanders
- Steep rocky slopes
- Unstable or fragile soils
- Abrupt elevation changes
- Bluffs, ledges, and cliffs except where featured as scenic resources
- Frequent wash crossings
- Locations requiring bridges or culverts
- Areas of heavy or fragile vegetation
- Areas requiring switchbacks
- Excessively long, straight sections
- Areas of archeological/cultural sensitivity
- Lightning-prone areas
- Unsafe or uncontrolled road crossings
- Known habitats of threatened or endangered plant or animal species

2. Grade

The degree to which a trail rises or falls over a linear distance is an important factor in determining the length of the trail, level of difficulty, appropriate user types, and drainage and maintenance requirements. Occasional fluctuations in the trail grade should be considered to provide variation for trail users and to facilitate proper drainage. Frequent or drastic changes in grade should be avoided. The grade line between control points can be plotted on paper to determine if switchbacks or other special features will be needed to sustain a certain grade. On moderate to steep side slopes a periodic reverse in the grade should be included to create dips for drainage purposes. When grade dips are included in initial trail construction, the need for waterbars is eliminated.

3. Drainage

Proper drainage of surface water is the most important factor in design, construction, and maintenance of trails. Surface erosion resulting from improper drainage will have a detrimental impact on the trail surface, causing damage to the natural environment and increasing maintenance requirements. The potential for erosion depends on three factors: soil type, velocity of water on the trail, and the distance water travels down the trail. Alteration of any of these factors can reduce the potential for erosion. Proper outsloping of the trail tread and the installation of grade dips or water bars will help decrease the potential for erosion of the trail surface. If distances allow, grade dips are preferred over waterbars. Existing drainage patterns of the surrounding area, such as concentrated drainage channels, must be maintained. Attempts to alter the existing drainage patterns will have a negative effect on the natural environment, and will most likely result in severe damage to the trail.

4. Staking/Flagging

Stakes or flags act as a guide so that the alignment, grade, and distances can be easily followed during construction. A clinometer, topographic map, compass, measuring tape, and notebook are all necessary tools. Proper location of the flag line is easily accomplished with three people acting as surveyor, rod holder, and recorder. Stakes or flags should be located along the trail centerline with the location of dips, walls, and other special structures indicated with color coded flagging. The trail alignment should pass through control points which are favorable for trail construction, and avoid control points which will inhibit trail construction. Normally, trail alignments follow the contours of the land and consists of a series of gently sweeping curves. Long straight segments with sharp angular turns should be avoided.

7-303 SPECIFICATIONS FOR TRAIL CLASSIFICATIONS

A. Urban Trails

1. Grade

Maximum sustained grade shall not exceed 8%. A maximum grade of 10% may be used for wash crossings, grade dips, and other trail segments to avoid impassable areas for a distance not to exceed 50 linear feet.

2. Tread

Urban Primary trail widths must be 8'. The trail tread should be comprised of native soils in undisturbed desert areas, and decomposed granite in areas that have been graded, landscaped, or will otherwise remain significantly unnatural. Compaction of a native soil tread surface may be necessary to prevent damage from use and to increase resistance to erosion. If decomposed granite is used, it must be ¼" minus Madison Gold (or similar), wetted and compacted to a 4" depth. A soil stabilizer may be added to the decomposed granite according to manufacturers' specifications. The trail tread must be smooth and free of all obstacles. The trail tread must be delineated from the surrounding terrain. For example, utilizing decomposed granite of a different size or color in the surrounding landscape will help distinguish the trail tread. The location of landscape plants, fences, and other physical barriers can also be used to delineate the trail.

3. Vegetation Clearance

Trails should be designed to have a minimum impact on plants identified for protection in the City of Scottsdale Native Plant Ordinance (see Section 7.500 of the City's Zoning Ordinance). Trail alignments that avoid and have the least impact on surrounding vegetation are preferred. If the trail must pass within an unacceptable distance to any plants, the preference is to relocate the plants rather than destroy them.

Vegetation may not exceed a mature height of 3' within a 3' distance of the trail tread. Vertical clearance must be at least 10' above the trail tread. This in no way implies that the trail corridor should be devoid of plants. Low growing desert shrubs such as bursage and brittle bush present no hazard to trail users, therefore

are acceptable to have within the clearing limits. The purpose of the vegetation clearing limits is to keep taller, potentially more dangerous plants such as thorny trees and larger cacti a safe distance from the trail. All remaining roots and stumps must be grubbed out of the trail surface to provide a smooth tread. No teddy bear cholla may be located within 3' of the trail tread. In areas where new landscaping is to be installed, trees, cacti, and other spiny plants must be planted at least 5' from the trail tread.

4. Drainage

The trail surface must have a cross slope of 3 to 5%. This is critical in preventing water from pooling on and channeling down the trail. If the trail traverses the side slope of a hill, the cross slope of the trail surface must be downward from the uphill to the downhill edge of the trail (outslope). This will allow surface water to drain off the edge of the trail rather than running down the length of the trail. The installation of erosion control structures such as water bars or grade dips may be required. The cross slope of such a trail tread must NOT be downward from the downhill to the uphill edge of the trail (inslope). Such a scenario will result in water channeling down the length of the trail causing extreme levels of erosion. If the trail is located on level ground, the trail surface should be crowned to drain water off both sides of the trail and prevent pooling.

5. Easement Width and Setback from Street

Urban trails must be contained in a minimum 15' wide trail easement. In situations where a trail easement overlaps with common tracts or easements dedicated for other purposes, it may be beneficial to dedicate the entire width for public trail purposes (see Section 7-302.B.2 for more detail). For trails along streets, the minimum distance from back of curb to the edge of the trail is 25' along expressways and parkways, 15' along arterials, 10' along collectors, and the maximum distance feasible in all other locations.

B. Rural Trails

1. Grade

Maximum sustained grade shall not exceed 10%. A maximum grade of 15% may be used for wash crossings, grade dips, and other trail segments to avoid impassable areas for a distance not to exceed 100 linear feet.

2. Tread

Rural trail widths must be 6'. The trail tread should be comprised of native soils in undisturbed desert areas, and decomposed granite in areas that have been graded, landscaped, or will otherwise remain significantly unnatural. Compaction of a native soil tread surface may be necessary to prevent damage from use and to increase resistance to erosion. If decomposed granite is used, it must be ¼" minus Madison Gold (or similar), wetted and compacted to a 4" depth. A soil stabilizer may also be added to the decomposed granite according to manufacturers' specifications. The trail tread must be smooth and free of all obstacles. The trail tread must be delineated from the surrounding terrain. For example, utilizing decomposed granite of a different size or color in the surrounding landscape will help distinguish the trail tread. The location of

landscape plants, fences, and other physical barriers can also be used to delineate the trail.

3. Vegetation Clearance

Trails should be designed to have a minimum impact on plants identified for protection in the City of Scottsdale Native Plant Ordinance (see Section 7.500 of the City's Zoning Ordinance). Trail alignments that avoid and have the least impact on surrounding vegetation are preferred. If the trail must pass within an unacceptable distance to any plants, the preference is to relocate the plants rather than destroy them.

Vegetation may not exceed a mature height of 3' within a 3' distance of the trail tread. Vertical clearance must be at least 10' above the trail tread. This in no way implies that the trail corridor should be devoid of plants. Low growing desert shrubs such as bursage and brittle bush present no hazard to trail users, therefore are acceptable to have within the clearing limits. The purpose of the vegetation clearing limits is to keep taller, potentially more dangerous plants such as thorny trees and larger cacti a safe distance from the trail. All remaining roots and stumps must be grubbed out of the trail surface to provide a smooth tread. No teddy bear cholla may be located within 3' of the trail tread. In areas where new landscaping is to be installed, trees, cacti, and other spiny plants must be planted at least 5' from the trail tread.

4. Drainage

The trail surface must have a cross slope of 6 to 10%. This is critical in preventing water from pooling on and channeling down the trail. If the trail traverses the side slope of a hill, the cross slope of the trail surface must be downward from the uphill to the downhill edge of the trail (outslope). This will allow surface water to drain off the edge of the trail rather than running down the length of the trail. The installation of erosion control structures such as water bars or grade dips may be required. The cross slope of such a trail tread must NOT be downward from the downhill to the uphill edge of the trail (inslope). Such a scenario will result in water channeling down the length of the trail causing extreme levels of erosion. If the trail is located on level ground, the trail surface should be crowned to drain water off the trail and prevent pooling.

5. Easement Width and Setback from Street

Rural trails must be contained in a minimum 25' wide trail easement. In situations where a trail easement overlaps with common tracts or easements dedicated for other purposes, it may be beneficial to dedicate the entire width for public trail purposes (see Section 7-302.B.2 for more detail). Rural trails must be located the maximum distance feasible from the edge of the street.

C. Backcountry Primary Trails

1. Grade

Maximum sustained grade shall not exceed 10%. A maximum grade of 15% is allowed for wash crossings, grade dips, and other trail segments to avoid impassable areas for a distance not to exceed 100 linear feet. Switchbacks may

be utilized when surrounding terrain has a side slope of 20 to 45%. Switchbacks supported by retaining walls may be utilized when surrounding terrain has a side slope up to 55%.

2. Tread

Backcountry Primary trail widths must be 4'. The trail surface should be native soil and must be smooth and free of major obstacles. Compaction of the surface may be necessary to prevent damage from use and to increase resistance to erosion.

3. Vegetation Clearance

Trails should be designed to have a minimum impact on plants identified for protection in the City of Scottsdale Native Plant Ordinance (see Section 7.500 of the City's Zoning Ordinance). Trail alignments that avoid and have the least impact on surrounding vegetation are preferred. If the trail must pass within an unacceptable distance to any plants, the preference is to relocate the plants rather than destroy them.

Vegetation may not exceed a mature height of 3' within a 3' distance of the trail tread. Vertical clearance must be at least 10' above the trail tread. This in no way implies that the trail corridor should be devoid of plants. Low growing desert shrubs such as bursage and brittle bush present no hazard to trail users, therefore are acceptable to have within the clearing limits. The purpose of the vegetation clearing limits is to keep taller, potentially more dangerous plants such as thorny trees and larger cacti a safe distance from the trail. All remaining roots and stumps must be grubbed out of the trail surface to provide a smooth tread. No teddy bear cholla may be located within 3' of the trail tread. This distance may need to be increased on the uphill side of trails that traverse steep hillsides. This will prevent pieces of cacti from falling onto the trail tread and creating a safety hazard.

4. Drainage

The trail surface must have a cross slope of 6 to 10%. This is critical in preventing water from pooling on and channeling down the trail. If the trail traverses the side slope of a hill, the cross slope of the trail surface must be downward from the uphill to the downhill edge of the trail (outslope). This will allow surface water to drain off the edge of the trail rather than running down the length of the trail. The installation of erosion control structures may be required. The cross slope of such a trail tread must NOT be downward from the downhill to the uphill edge of the trail (inslope). Such a scenario will result in water channeling down the length of the trail causing extreme levels of erosion. If the trail is located on level ground, the trail surface should be crowned to drain water off the trail and prevent pooling.

5. Easement Width

Backcountry Primary trails are typically located within large open space areas controlled by the City. In situations where these trails must be located within easements, the easement width must be a minimum of 50'.

D. Backcountry Secondary Trails

1. Grade

Maximum sustained grade shall not exceed 15%. A maximum grade of 20% is allowed for wash crossings, grade dips, and other trail segments to avoid impassable areas for a distance not to exceed 25 linear feet. Switchbacks may be utilized when surrounding terrain has a side slope of 20 to 45%. Switchbacks supported by retaining walls may be utilized when surrounding terrain has a side slope up to 55%.

2. Tread

Backcountry Secondary trail widths must be 2'. The trail surface should be native soil and must be smooth and free of major obstacles. Compaction of the surface may be necessary to prevent damage from use and to increase resistance to erosion.

3. Vegetation Clearance

Trails should be designed to have a minimum impact on plants identified for protection in the City of Scottsdale Native Plant Ordinance (see Section 7.500 of the City's Zoning Ordinance). Trail alignments that avoid and have the least impact on surrounding vegetation are preferred. If the trail must pass within an unacceptable distance to any plants, the preference is to relocate the plants rather than destroy them.

Vegetation may not exceed a mature height of 3' within a 3' distance of the trail tread. Vertical clearance must be at least 10' above the trail tread. This in no way implies that the trail corridor should be devoid of plants. Low growing desert shrubs such as bursage and brittle bush present no hazard to trail users, therefore are acceptable to have within the clearing limits. The purpose of the vegetation clearing limits is to keep taller, potentially more dangerous plants such as thorny trees and larger cacti a safe distance from the trail. All remaining roots and stumps must be grubbed out of the trail surface to provide a smooth tread. No teddy bear cholla may be located within 3' of the trail tread. This distance may need to be increased on the uphill side of trails that traverse steep hillsides. This will prevent pieces of cacti from falling onto the trail tread and creating a safety hazard.

4. Drainage

The trail surface must have a cross slope of no less than 10%. This is critical in preventing water from pooling on and channeling down the trail. If the trail traverses the side slope of a hill, the cross slope of the trail surface must be downward from the uphill to the downhill edge of the trail (outslope). This will allow surface water to drain off the edge of the trail rather than running down the length of the trail. The installation of erosion control structures may be required. The cross slope of such a trail tread must NOT be downward from the downhill to the uphill edge of the trail (inslope). Such a scenario will result in water channeling down the length of the trail causing extreme levels of erosion. If the trail is located on level ground, the trail surface should be crowned to drain water off the trail and prevent pooling.

5. Easement Width

Backcountry Secondary trails are typically located within large open space areas controlled by the City. In situations where these trails must be located within easements, the easement must be a minimum of 50' wide.

E. Interpretive

1. Special Note

Interpretive trails differ from other trails because their primary function is to provide educational opportunities for trail users. Education and interpretation can occur in a variety of forms including signage and/or brochures. This manual contains only general guidelines for the design and construction of Interpretive trails. The planning, design, and construction of interpretive trails within the City of Scottsdale requires the involvement and oversight of the City Trails Coordinator.

2. Grade

Maximum sustained grade shall not exceed 10%. A maximum grade of 15% is allowed for wash crossings, grade dips, and other trail segments to avoid impassable areas for a distance not to exceed 100 linear feet. Switchbacks may be utilized when surrounding terrain has a side slope of 20 to 45%. Switchbacks supported by retaining walls may be utilized when surrounding terrain has a side slope up to 55%.

3. Tread

Interpretive trail widths must be 4' to 6'. The trail tread should be comprised of native soils in undisturbed desert areas, and decomposed granite in areas that have been graded, landscaped, or will otherwise remain significantly unnatural. Compaction of a native soil tread surface may be necessary to prevent damage from use and to increase resistance to erosion. If decomposed granite is used, it must be ¼" minus Madison Gold (or similar), wetted and compacted to a 4" depth. A soil stabilizer may also be added to the decomposed granite according to manufacturers' specifications. The trail tread must be smooth and free of all obstacles. The trail tread must be delineated from the surrounding terrain. For example, utilizing decomposed granite of a different size or color in the surrounding landscape will help distinguish the trail tread. The location of landscape plants, fences, and other physical barriers can also be used to delineate the trail.

4. Vegetation Clearance

Trails should be designed to have a minimum impact on plants identified for protection in the City of Scottsdale Native Plant Ordinance (see Section 7.500 of the City's Zoning Ordinance). Trail alignments that avoid and have the least impact on surrounding vegetation are preferred. If the trail must pass within an unacceptable distance to any plants, the preference is to relocate the plants rather than destroy them.

Vegetation may not exceed a mature height of 3' within a 3' distance of the trail tread. Vertical clearance must be at least 8' above the trail tread. This in no way implies that the trail corridor should be devoid of plants. Low growing desert shrubs such as bursage and brittle bush present no hazard to trail users, therefore are acceptable to have within the clearing limits. The purpose of the vegetation clearing limits is to keep taller, potentially more dangerous plants such as thorny trees and larger cacti a safe distance from the trail. All remaining roots and stumps must be grubbed out of the trail surface to provide a smooth tread. No teddy bear cholla may be located within 3' of the trail tread. This distance may need to be increased on the uphill side of trails that traverse steep hillsides. This will prevent pieces of cacti from falling onto the trail tread and creating a safety hazard.

5. Drainage

The trail surface must have a cross slope of 3 to 5%. This is critical in preventing water from pooling on and channeling down the trail. If the trail traverses the side slope of a hill, the cross slope of the trail surface must be downward from the uphill to the downhill edge of the trail (outslope). This will allow surface water to drain off the edge of the trail rather than running down the length of the trail. The installation of erosion control structures may be required. The cross slope of such a trail tread must NOT be downward from the downhill to the uphill edge of the trail (inslope). Such a scenario will result in water channeling down the length of the trail causing extreme levels of erosion. If the trail is located on level ground, as opposed to the side slope of a hill, the trail surface should be crowned to drain water off the trail and prevent pooling.

F. Barrier-Free

1. Special Note

Barrier-free trails are designed to provide opportunities for persons with physical disabilities including mobility, visual, and hearing impairments, and shall meet the standards of the Americans with Disabilities Act Guidelines (ADA). This manual contains only general guidelines for the design and construction of barrier-free trails. The planning, design, and construction of barrier-free trails within the City of Scottsdale requires the involvement and subsequent approval of appropriate City representatives including the City Trails Coordinator.

2. Grade

Barrier-free trails must be designed with the least possible longitudinal slope. The maximum sustained grade shall not exceed 5%. Trail segments that exceed the maximum sustained grade limit must be constructed according to handicapped accessible ramp standards. Barrier-free trails must not be constructed on side slopes greater than 40%. Total trail distance should not exceed 1.5 miles.

3. Tread

Barrier-free trail widths must be 7' for two-directional travel, and 5' for one-way travel. There are many varieties of accessible surface materials available. Materials should be selected to achieve the maximum level of accessibility practicable according to the desired recreation experience and the natural setting.

The chosen surface must be stable, firm, and slip resistant. The material must match the surrounding environment.

4. Vegetation Clearance

Trails should be designed to have a minimum impact on plants identified for protection in the City of Scottsdale Native Plant Ordinance (see Section 7.500 of the City's Zoning Ordinance). Trail alignments that avoid and have the least impact on surrounding vegetation are preferred. If the trail must pass within an unacceptable distance to any plants, the preference is to relocate the plants rather than destroy them.

Vegetation may not exceed a mature height of 3' within a 3' distance of the trail tread. Vertical clearance must be at least 8' above the trail tread. This in no way implies that the trail corridor should be devoid of plants. Low growing desert shrubs such as bursage and brittle bush present no hazard to trail users, therefore are acceptable to have within the clearing limits. The purpose of the vegetation clearing limits is to keep taller, potentially more dangerous plants such as thorny trees and larger cacti a safe distance from the trail. All remaining roots and stumps must be grubbed out of the trail surface to provide a smooth tread. No teddy bear cholla may be located within 3' of the trail tread. This distance may need to be increased on the uphill side of trails that traverse steep hillsides. This will prevent pieces of cacti from falling onto the trail tread and creating a safety hazard.

5. Drainage

The trail surface must have a cross slope of 1 to 3%. This is critical in preventing water from pooling on and channeling down the trail. If the trail traverses the side slope of a hill, the cross slope of the trail surface must be downward from the uphill to the downhill edge of the trail (outslope). This will allow surface water to drain off the edge of the trail rather than running down the length of the trail. The cross slope of such a trail tread must NOT be downward from the downhill to the uphill edge of the trail (inslope). Such a scenario will result in water channeling down the length of the trail causing extreme levels of erosion. If the trail is located on level ground, the trail surface should be crowned to drain water off the trail and prevent pooling. The longitudinal slope of barrier-free trails must be kept to the minimum standard, therefore the installation of erosion control structures is not necessary.

6. Additional Specifications

Support facilities for barrier-free trails, such as signage, restrooms, benches, and parking areas must be constructed to meet accessibility standards.

7-304 TRAIL CONSTRUCTION

A. Tread Construction (Figure 7.3-1)

1. Surface Materials

Trail surface materials must correspond to the specification for the appropriate trail classification under Section 7-303.A.

2. Cross Slope (Figure 7.3-1)

The cross slope, which is the slope of the tread surface perpendicular to the longitudinal slope, is a critical factor in the design, construction, and maintenance of trails. The cross slope allows surface water to drain off the side of the trail rather than along the longitudinal slope. The three primary types of cross slopes are outslope, inslope, and crowned. Outsloped and insloped trail surfaces typically occur on trails which traverse the side slope of a hill, and a crowned trail surface is typically found on trails which travel across relatively level ground.

a. Outslope (Figure 7.3-1)

Outslope is the most common type of cross slope used on trails that traverse the side slopes of hills, and occurs when the trail surface slopes downward from the uphill to the downhill edge of the trail. Standard outslopes range from 1 to 10%, depending on the trail classification.

b. Inslope (Figure 7.3-1)

Inslope is the most infrequent variety of cross slope used on trails that traverse the side slopes of hills, and occurs when the trail surface slopes downward from the downhill to the uphill edge of the trail. Insloped trails are discouraged and not recommended except when used as a component of switchback turns. Inslopes must be used in conjunction with rock lined swales that collect the water and channel it away from the trail. The improper use of an insloped trail surface will cause extreme erosion to the trail surface and the surrounding environment, therefore should not be built without consulting the City Trails Coordinator.

c. Crowned (Figure 7.3-1)

A crowned surface is most commonly used on trails that traverse relatively level ground. A crowned trail surface slopes downward from the center line to each outside edge for the purpose of preventing surface water from pooling on the trail surface. The slopes from the centerline to each edge should be 5%.

3. Backslope (Figure 7.3-2)

The backslope is the area from which material is excavated on the uphill side of the trail tread. Backslopes range from steep to gentle depending on the side slope of the hill and the characteristics of the soil. As a general rule, the backslope cannot be steeper than the soil's ability to remain in place under typical climatic conditions. Rip-rap on moderate backslopes and retaining walls on steeper backslopes may be needed to stabilize the backslope in areas with steep side slopes or unstable soils. The use of retaining walls to support the backslope will require excavating less material.

4. Fillslope (Figure 7.3-2)

The fillslope is created by adding material to build up and support the downhill edge of the trail tread. The material removed as part of the backslope or from nearby borrow pits is often used in the fillslope. Rip-rap on moderate fillslopes and retaining walls on steeper fillslopes may be needed to support the fillslope in areas

with steep side slopes or loose soils. The fillslope should be revegetated following construction to regain the natural appearance and to reduce the potential for erosion.

5. Typical Trail Cross-sections (Figure 7.3-3)

a. Full Bench

Full bench trail construction involves the greatest amount of soil removal, but provides the most stable trail surface. In this type of construction, soil is removed from the backslope and cast down the hill. The excavated material is not used as fill to support the trail tread. Instead, the entire trail tread is supported by solid mineral soil. Full bench construction is best suited for trails on steep side slopes greater than 50% because fill will erode easily.

b. $\frac{3}{4}$ Bench

This type of trail construction should be used on side slopes of 30 to 50%. The soil excavated from the backslope should be used for the fillslope. The fillslope should represent the downhill $\frac{1}{4}$ of the trail width. The fillslope should be revegetated to restore the natural condition and reduce the potential for erosion.

c. Balanced Section

Balanced section trail construction should be utilized on side slopes of 10 to 30%. The soil excavated from the backslope should be used for the fillslope. The fillslope should represent the downhill $\frac{1}{2}$ of the trail width. The fillslope should be revegetated to restore the natural condition and reduce the potential for erosion.

d. Natural Slope

This type of trail construction is to be used when side slopes are less than 10%. Natural slope trail construction involves no cutting or filling, therefore there is no backslope or fillslope.

B. Vegetation Clearance (Figure 7.3-4)

This process involves the removal of vegetation from within the specified clearing limits. See Section 7-303.A for the vegetation clearance limit specifications for each trail classification. The primary goal of this process is to provide the specified clearance, while maintaining the maximum amount of vegetation and the natural characteristics of the area. Trails shall be aligned to prevent disturbance to the plants identified in the City of Scottsdale Native Plant Ordinance (see Section 7.500 of the City's Zoning Ordinance). The trail should also be aligned to avoid large scale removal of native plants not covered by the Native Plant Ordinance whenever possible. When branches must be removed, they should be cut as close to the main trunk as possible, without cutting into the branch collar. Proper branch removal should be done by making three cuts with a handsaw: one partial cut from the underside of the branch approximately 6 to 8 inches from the trunk; a second cut from the top of the branch above the first cut which will remove the branch; and the final cut to remove the stub. Be sure not to cut into the branch collar, as this will damage the tree and

slow the healing process. Chemical sealants should not be applied to native trees. Cholla and prickly pear cacti should be trimmed at the segment joints. Plants which must be completely removed should be cut as close to the ground surface as possible. All removed vegetation should be dispersed in areas not clearly visible from the trail.

C. Surface Water Control

The proper control of surface water is a crucial element in trail design, construction, and maintenance. Improper control will most likely have a negative effect on the surrounding environment, and will result in damage to the trail which can be very expensive to repair. The need for surface water control structures depends on many different factors including, but not limited to soil type, longitudinal and cross slopes, and existing drainage patterns. The most effective time to address surface water control issues is during initial trail design and construction.

1. Grade Dips (Figure 7.3-5)

Grade dips are short segments of trail with a grade opposite to the prevailing grade designed to route surface water off the trail. They are most effective when installed during new trail construction. The low point of the dip must be outsloped at the maximum percentage permitted for the given trail classification to assure that water will flow off and away from the trail. A rock apron must be constructed where the water flows out of the dip to prevent excessive erosion and damage to the surrounding environment. Grade dips are generally more effective than waterbars, require less maintenance, and are more suitable for equestrians and mountain bicyclists.

2. Waterbars

Waterbars are native rocks or logs embedded in the trail surface at a 45 degree angle to the longitudinal slope for the purpose of directing surface water off the trail. Waterbars should extend at least 1' beyond each edge of the trail tread to ensure that water is diverted completely. Use fill material to build up the downhill side of the waterbar. Construct a drain ditch leading off the edge of the trail to ensure that runoff flows away from the trail. The drain should be at least 1' wide and 8" deep. Rocks should be placed in the bottom of the drain ditch to lessen the amount of erosion. Place additional rocks, logs, brush, or other debris in locations that will prevent trail users from detouring around the waterbar. Waterbars are not the preferred drainage structures on trails with large amounts of equestrian and mountain bicycle use. Grade dips are more appropriate in such situations.

a. Rock Waterbar (Figure 7.3-6)

This type of waterbar is constructed by embedding large rectangular shaped rocks into the trail tread at a 45 degree angle to a depth roughly half their height. Rocks must be large enough not to be knocked out by trail users and to effectively channel water off the trail. Rocks must be arranged in a shingle fashion, tightly overlapping each other towards the downhill side. Compact small rocks and fill around the base to ensure solid placement.

b. Log Waterbar (Figure 7.3-7)

This type of waterbar is constructed by embedding solid, bark-free, rot-resistant timber into the trail surface at a 45 degree angle. Creosote-treated railroad ties or telephone poles are not acceptable for use as waterbars. Logs must have a minimum of an 8" diameter and be embedded half-way into the trail surface. Log waterbars must be secured with two 18" long ½" diameter pieces of rebar. Drill a 7/16" hole through the log 8" from each end. Place the log in the desired location and drive the rebar through the holes into the trail surface until flush with the log surface. The use of log waterbars must be approved by the City Trails Coordinator.

3. Culverts

In desert environments, most watercourses flow only seasonally, therefore, culverts are usually not necessary. Culverts tend to be maintenance intensive and can detract from the aesthetics of the natural environment. Culverts should only be constructed where a gentle grade must be maintained such as with a barrier-free trail or where there is permanently flowing water. In all other situations a wash crossing (see Section 7-303.E.3 of this manual) should be used. Rock or pipe culverts must match the downstream gradient and have a diameter of at least 12" to accommodate necessary cleaning. Improperly constructed culverts will clog with debris causing water to flow over and damage the trail tread. All rock used in the construction of culverts must be native.

a. Rock Culvert (Figure 7.3-8)

The proper construction of rock culverts depends greatly on the proper selection and placement of rocks of sufficient size and shape. The bottom surface of the drainage must be armored with rocks to prevent erosion. Stone headwalls must be placed to armor the outside faces of the crossing. All rocks must be firmly placed similar to the construction of a retaining wall.

b. Pipe Culvert (Figure 7.3-9)

Pipe diameter must be at least 12". Embed the pipe in a stable foundation of gravel and soil, and backfill with compacted gravel and soil. Construct a headwall of firmly placed native stone to protect the outside faces of the tread crossing and cover the pipe so it cannot be viewed from the trail. The trail tread should be at least 6" higher than the top of the pipe.

D. Special Structures

1. Retaining Walls (Figure 7.3-10)

Retaining walls are stone structures used to stabilize trails on steep side slopes. Retaining walls are more solid than rip-rap, as they must support the full weight of the trail tread. A solid foundation is key to the strength and durability of a retaining wall. The foundation should be set in solid earth or rock, with the base sloped inward towards the hillside. Rock used in construction should be derived from the surrounding area. Ideal rocks are durable, weather resistant, and free of structural defects. Large rocks should be used in the foundation, smaller rocks in the middle tiers, and large rocks again for the upper tiers. Approximately 25% of the rocks

used in the wall must be header stones. A header stone is a rock placed with its longest dimension extending into the hillside, perpendicular to the face of the wall. All other rocks should be placed with their longest dimension parallel to the face of the wall. Thickness of the wall should be at least one-half its height, or 2' thick if the height is less than 5'. The outer face of the wall should slope inward towards the hillside at a rate of 3" per every 12" in height. Joints should be staggered at least 6" horizontally. Each rock should contact the rock below in at least 3 places. Shims must not be used because they are prone to shifting. If cement is used to provide additional stability, it must be colored to match the native rock. Backfill the wall with small stones and cover with soil until the proper tread surface is established.

2. Rip-Rap (Figure 7.3-11)

Unlike a retaining wall, rip-rap does not support the weight of the trail tread. Instead, rip-rap is used to stabilize steep slopes above and below the trail tread (backslope and fillslope, respectively). Begin by clearing a firm foundation at the downhill edge of the rip-rap. Set the largest rocks in the foundation. Place smaller rocks on the surface of the slope continuing up the slope to the desired location. Be sure that the rip-rap does not impede the flow of surface water off the trail tread. Rip-rap can also be used to protect drainage and lead-off ditches from heavy erosion, and to stabilize switchback turns. Rip-rap should be constructed of native rock. If cement is used to provide additional stability, it must be colored to match the native rock.

3. Wash Crossings (Figure 7.3-12)

When trails cross washes the greatest concern is protecting the trail from flowing water. The trail segments approaching the crossing, and the location where the trail meets each edge of the wash must be stabilized with securely placed rocks. Trail segments approaching the wash should range from 8 to 15% for all trail classifications, and cross at a 90 degree angle to the wash to prevent water from leaving the primary channel and flowing along the trail surface. The slopes adjacent to the trail may need to be stabilized with rip-rap. A row of large rocks should be embedded along the wash banks at the point of contact with the trail. Be sure that the flowing water will not undercut these rocks.

4. Switchback and Climbing Turns (Figure 7.3-13)

These two trail design elements are both used to change the direction of travel on a hillside and to gain elevation in a short distance. The difference between the two is that climbing turns maintain a consistent longitudinal slope through the turn, while switchbacks have a near level landing at the turning point. These structures can be very difficult to construct, therefore careful planning should be conducted to avoid using them. The City Trails Coordinator should be consulted in situations where switchbacks may be necessary.

Avoid "stacking" a set of many short switchbacks and/or climbing turns on a hillside. Longer trail segments between switchbacks and/or climbing turns are less visible and reduce shortcutting by trail users. Understanding the psychology of the trail user is important in the design of these structures. The layout must convince the user that the established trail is the easiest, most convenient route to ascend the slope. If they feel it is not, they will create short cuts.

a. Switchback Turn (Figure 7.3-14)

Switchback turns are typically used on side slopes of 20 to 45%, but can be used on slopes up to 55% with the use of retaining walls. These structures are extremely difficult and expensive to construct. Trail routes should be planned carefully to avoid areas of steep, impassible terrain that would require switchbacks.

The key to a good switchback is proper placement on the terrain. Naturally occurring level areas or platforms are prime locations. Survey the hillside that the trail must ascend, locate the natural platforms, then connect the trail to these points. Trail segments leading to and away from the switchback must maintain the maximum longitudinal slope permitted for that trail classification. Locating switchbacks in areas where there are obstructions such as rock outcroppings or trees that will prevent shortcutting is also desirable. Obstructions such as rocks, logs, or other debris may also be strategically placed to keep users from leaving the trail.

A switchback consists of two approaches, a landing or turn platform, a drain for the upper approach and platform, and guide structures. The upper approach and the upper half of the turn platform are excavated from the hillside. The lower approach and the lower half of the turn platform are constructed on fill. The construction of switchbacks on a full bench can be very labor intensive and expensive. The last 65' feet of each approach before reaching the turn platform should be as steep as the trail classification will allow. The last 10' of the approaches should be smoothly transitioned into the grade of the turn platform. A flat grade approaching the turn platform must be avoided because it will cause trail users to short cut the switchback.

As the upper approach descends toward the turn, a drain dip should be installed. Below this point, the tread and the upper half of the turn platform must be insloped towards a drain ditch. The ditch must be 1' deep and 1' wide and have a rock apron at the spill point.

The turn platform must not exceed a slope of 5%. The upper side is excavated from the hillside. The removed soil is then used to fill in the lower portion. Rip-rap or retaining walls may be required to provide stability to the backslope and fillslope. The turning radius must be no less than 8' to provide adequate turning area for equestrians and mountain bicyclists.

The lower portion of the turn platform and the lower approach should be outsloped. Rip-rap or a retaining wall may be needed along the inner portion of the switchback to maintain the backslope of the lower approach.

b. Climbing Turns (Figure 7.3-15)

Climbing turns are similar to switchbacks because they are also used to reverse the direction of travel and gain elevation. Climbing turns differ however because they maintain a uniform longitudinal slope through the turn. There is no level turning platform. A climbing turn is built on the same slope as the hillside. Where the slope of the hillside turns, the climbing turn ascends at the same rate. Climbing turns must not be constructed on side slopes greater

than 20% because they are prone to erosion. Climbing turns in appropriate terrain require very little work to construct. The approaches to the turn should be full bench construction. As the trail approaches the turn, the amount of excavation decreases. The turn itself requires no excavation other than the removal of the surface layer of leaf litter.

5. Steps (Figure 7.3-16)

The use of steps should be avoided due to unsuitability for equestrians and mountain bicyclists, and excessive maintenance requirements. Steps should only be used on hiker-only trails when elevation must be gained rapidly over a short distance and there is no other option. Steps must not be used on trails intended for use by equestrians or mountain bicyclists. Steps should be constructed of rock collected from the surrounding area. Rocks should be rectangular in shape, large enough to maintain their position (50 to 100 pounds each), and wide enough to span the width of the trail. Choose a location that will prevent trail users from traveling around the steps. Construction should begin with the lower steps and continue up the slope. Each step must be placed in an excavated seat and backfilled with small rocks and soil to assure stability.

6. Safety Barriers (Figure 7.3-17)

a. Location

The location of safety barriers shall not restrict sight distances for roadway traffic or trail users. Refer to Chapter 3, Figure 3.1-8 of the City Design Standards and Policies Manual for roadway sight distance requirements. Special attention to the design and construction of barriers is particularly important near intersections. Safety barriers must be installed between a trail and a roadway if the trail is located within an unsafe distance to the roadway, or if the trail shares an underpass or overpass with a roadway. Safety barriers must also be installed if the trail is elevated above an adjacent roadway and the side slope is greater than 6:1, or where trails are in close proximity to other steep drop-offs. All safety barriers must be at least 3' from the edge of the trail.

b. Design Criteria

Appropriate safety barriers include fences, railings, or suitably thick vegetation. Other types of materials may be suitable subsequent to approval of the City Trails Coordinator. The materials and character of the barrier must be compatible with adjacent development, landscaping, and topography. The minimum height shall be 4' for structural barriers, and 5' for vegetation barriers.

7. Trail Access Gates (Figure 7.3-18)

These gates are designed to restrict motorized access to trails except as permitted for maintenance and emergency purposes. The gate design must permit equestrian passage without requiring the rider to dismount. These gates should be located at trailheads, where trails cross major roads, and at other points where motorized vehicles are likely to attempt to access a trail. These gates must be constructed of heavy gauge metal or other durable low-maintenance materials.

8. Trail Junctions (Figure 7.3-19)

A trail junction occurs when two or more trails intersect. The majority of trail junctions will be "T-shaped." The joining trails shall maintain the width specified for that trail classification. However, the corners of the intersection may be recessed up to 1'. The intersection corners must be protected with large rocks, trees, transplanted vegetation, or other physical barriers to prevent trail users from short cutting the trail junction. Triangular shaped intersections with sweeping paths at the corners are NOT acceptable.

E. Road Crossings

1. Overpasses (Figure 7.3-20)

An overpass is a structure spanning a roadway, canal, wash, etc. that functions exclusively as a crossing for a shared-use trail. There are many different varieties of overpasses that may be acceptable. The City Trails Coordinator must be involved in the planning and design process, and must approve all overpasses prior to construction.

The minimum trail width on an overpass is 8'. The outside edges of an overpass must be lined with minimum 4.5' tall solid concrete barriers. Structures passing over streets must have a chain link fence or similar type material mounted along the upper surface of the concrete barrier extending to a height of 10'. The upper few feet of the fence should curve inward at a 2' radius. The fence may completely enclose the overpass depending on the nature of the obstacle below. A 10' height clearance must be permitted for equestrians. A minimum 4.5' tall concrete barrier must also separate the trail from the roadway. Non-paved surfaces should be decomposed granite. Paved surfaces must be chip-sealed asphalt or broom-finished concrete to provide slip resistance. The grade of the overpass and approaches must not exceed 10%. Drains must be provided if the cross slope is less than 2%. Drains must be flush with the concrete surface and slip resistant. Approaches to the overpass cannot be helical and must comply with the specifications established for that trail classification. Railings should line the approaches for 12' leading up to each end of the overpass.

2. Bridges (Figure 7.3-20)

A bridge is a structure spanning a roadway, canal, wash, or other obstacle that serves as a crossing for a roadway as well as a shared-use trail. The City Trails Coordinator must be involved in the planning and design process, and must approve all bridge crossings prior to construction.

The minimum width of a trail crossing a bridge is 8'. The outside edge of the bridge must be lined with minimum 4.5' tall solid concrete barrier. Bridges passing over streets must have a chain link fence or similar type material mounted along the upper surface of the concrete barrier extending to a height of 10'. The upper few feet of the fence should curve inward at a 2' radius. A 10' height clearance must be permitted for equestrians. A minimum 4.5' tall concrete barrier must also separate the trail from the roadway. The grade of the bridge crossing and approaches must not exceed 10%. Non-paved bridge surfaces should be decomposed granite. Paved bridge surfaces must be broom-finished concrete or chip-sealed asphalt to provide slip resistance. Drains must be provided if the

cross slope is less than 2%. Drains must be flush with the concrete surface and slip resistant.

3. Underpasses (Figure 7.3-21)

These structures, used to provide passage for trail users under roadways, are typically constructed of pre-cast concrete box culverts. Other varieties of culverts are acceptable provided they meet the required dimensions, and allow footing that is appropriate for all types of trail users. The width of a trail traveling through an underpass should not be less than 12'. Vertical clearance is an important concern, particularly for equestrian trail users. The minimum vertical clearance is 9' at a distance of 4' from the centerline, and 11' at a distance of 3' from the centerline. Natural or vandal-resistant electric lighting should be installed for safety. Sight distances approaching and exiting the underpass must be adequate as to not create a safety hazard. Underpass design shall not allow for the accumulation of nuisance water on the trail. If water does not drain from the underpass by gravity flow, a pump system must be provided to remove the water. The surface of the underpass should be slip resistant.

4. At-Grade Crossings

An at-grade crossing occurs where a trail passes across the surface of a roadway. Safety of trail users is the primary concern when planning at-grade trail crossings. Ideal locations for such crossings are at roadway intersections with light amounts of traffic that have existing stop signs, traffic lights, or designated pedestrian crossings. Motorists expect to see pedestrians crossing roads at intersections as opposed to along stretches of road with no intersections. Crossings should be on level grades where both trail users and motorists have long sight distances. Sight distances vary depending on the roadway classification. See Chapter 3.1, Figure 3.1-8 of the City Design Standards and Policies Manual for more details. Additional safety precautions include installing pedestrian activated traffic signals, signs warning motorists of the trail crossing, and signs warning the trail users of the road crossing. Equestrians and mountain bicyclists may be encouraged to dismount before crossing. Trails should cross driveways at a distance far enough from the main road to provide motorists turning into the driveway, and trail users crossing the driveway adequate sight distances.

F. Trail Access Facilities (Figure 7.3-22)

The design criteria for trail access facilities addressed in this manual are conceptual. The planning, design, and construction of such facilities will be conducted on a case-by-case basis and will require various levels of City review and approval beyond the scope of this manual.

The location and design of trail access facilities shall be done in accordance with existing City plans and should meet established management objectives. Design variations include size, layout, and amenities. These variations are based primarily on topography, planned levels and types of use, and the character of the surrounding area.

The design of trail access facilities ranges from neighborhood access points with little or no amenities, up to larger destination-type facilities which provide a wider variety of amenities. Potential trailhead amenities include, but are not limited to, pull-through

horse trailer parking spaces, regular vehicle parking spaces, potable drinking water, water troughs for horses, hitching posts or corrals, year-round natural shade areas, bike racks, informational, interpretive and directional signage, entrance gates, restrooms, shade ramadas, and picnic tables.

7-305 TRAIL SIGNS AND MARKERS

A. Locations

The proper location of signage is important in maintaining the safety of trail users, preserving the natural environment, and promoting the presence of the trail. The number and location of signs should be carefully considered, as a lack of signage or poorly located signs can create hazardous situations for trail users. An overabundance of signs can also detract from the aesthetics of the trail and decrease the quality of the trail users' experience.

Trail signs are typically located at trail intersections, locations where trails cross roadways, and any other areas where it may be difficult to follow the route of the trail. Trail signs should be placed 1.5' to 3' from the edge of the trail.

B. City of Scottsdale Standard (Figure 7.3-23 & 24)

NOTE: This standard applies specifically to trails classified as Urban or Rural. Additional standards may be developed for Backcountry Primary and Secondary trails pending review and approval of the City's Preserve Division.

1. Sign Specifications

a. Blanks

Sign blanks must be 0.080 gauge aluminum. Blanks must be covered with reflective sheeting of street transportation quality vinyl. There must be 2 pre-drilled 3/8" holes. The holes must be centered horizontally with the center of each hole being 1/2" from the top and bottom edges. Corners must be rounded with a 1" to 1 1/2" radius, depending on the size of the sign.

b. Lettering

Font must be Garamond (or similar style). Point size should be relative to the size of the sign.

c. Colors

Background must be dark brown with reflective white lettering and symbols. There must be a 1/4" - 1/2" white reflective border.

d. Sign Mounting Hardware

3/8" vandal resistant steel drive rivets.

2. Sign Post/Anchor Specifications

a. Posts

Posts shall be constructed of 1 3/4" x 1 3/4" 12-gauge square steel tubing with 7/16" pre-punched knockouts on 1" centers. Post lengths must be 5' or 8'. All steel posts shall be sandblasted with 100 grit sand and chemically treated to provide a natural looking "rust" finish. The application of rust-colored paint is not acceptable.

b. Anchors

Anchors shall be 2" x 2" x 30", 12-gauge galvanized square tubing with 7/16" pre-punched knockouts on 1" centers.

c. Sleeves

Sleeves shall be 2 1/4" x 2 1/4" x 12", 12-gauge galvanized square tubing with 7/16" pre-punched knockouts on 1" centers.

d. Anchor Assembly Hardware

3/8" vandal resistant steel drive rivets.

e. Telescoping Properties

The finish post, anchor, and sleeve must be straight with a smooth uniform finish to allow each component to telescope with each consecutive larger or smaller piece.

C. Installation (Figure 7.3-25)

Sign posts are to be installed according to City of Scottsdale Standard Detail 2131. The final height of the post should be either 3' or 6'. The height depends on the location of the post and the signs to be placed on it. The 3' posts should be placed at trail intersections or areas where it may be difficult to follow the route of the trail. The 3' posts are intended for combinations of signs shown in Figure 7.3-24. These signs shall not exceed two per post. The 6' posts should be placed in more prominent locations such as trail access points or major trail junctions. The 6' posts are intended for the larger sign shown in Figure 7.3-23. The triangular sign from Figure 7.3-24 or regulatory signs such as "no motorized vehicles" signs may be placed on the 6' post below the larger trail sign. All signs are to be mounted to the posts with 3/8" vandal resistant steel drive rivets.

D. Developer-Provided Sign Standard

Developers may provide their own signage consistent in color and theme with the surrounding development. At a minimum, these signs must accommodate the triangular "Trail Courtesy" graphic, the "City of Scottsdale Trail System" logo, and the standard hiker, equestrian, and mountain bicycle icons. These required signs may be installed on the same post as developer-provided signs, or the graphics may be incorporated directly into the developer-provided sign. The graphics for the signs may be obtained by contacting the City Trails Coordinator.

7-306 TRAIL MAINTENANCE

A. Slough and Berm Removal (Figure 7.3-26)

Slough (pronounced “sluff”) is material that has moved downhill from the backslope and been deposited along the uphill edge of the tread. This process causes trail users to travel along the outside edge of the trail. The tread eventually narrows and moves downhill from its original location resulting in an unsafe situation. The slough must be removed to re-establish the proper backslope. The excess material may be used to fill holes in the trail tread and re-establish the outslope, or to build up the downhill side of waterbars. Berm is soil that has built up on the downhill edge of the trail tread. Berm prevents water from flowing off the side of the trail and allows water to channel down the trail causing erosion. A berm may also cause nuisance water to pool on the trail surface resulting in soil saturation. Saturated soil is damaged easily and forces trail users to detour around the area causing the trail to widen. Berms should never be constructed intentionally, and should be eliminated whenever present.

B. Vegetation Clearance Maintenance

All plants encroaching on the vegetation clearance limits for the particular trail classification must be cut back. Branches should be cut close to the main stem without cutting into the branch collar. Plants being removed must be cut flush with the ground and stumps must be removed to prevent safety hazards. All plants growing within the trail tread must be grubbed-out. Trails within landscaped areas may be sprayed with herbicide. All removed plant material must be scattered in a location not visible from the trail.

C. Tread Maintenance

In addition to slough and berm removal, the remaining trail tread should be restored to its original design condition. All loose rocks, rock points, stumps, and roots protruding from the trail surface should be removed. All holes should be filled to create a smooth, obstacle-free trail tread. Maintaining a proper outslope is critical to the long-term condition of the trail.

D. Drainage Maintenance

Special attention should be directed to the maintenance of drainage structures. These structures are extremely important in protecting the trail from erosion. If they are not maintained properly, the trail will be prone to erosion, and may become unsafe for public use and require extensive amounts of labor to repair. All repairs to drainage structures must restore them to their original standard construction specifications.

E. Special Structure Maintenance

Structures such as waterbars, culverts, switchbacks, retaining walls, wash crossings, overpasses, bridges, etc. are rather expensive and labor intensive to construct. Proper maintenance will prolong the life of the structures and help prevent safety hazards. Structures should be inspected annually and maintenance performed as needed. All repairs to special structures must restore them to their original standard construction specifications.

F. Sign Maintenance

Sign maintenance includes replacing missing or damaged signs and assuring the accuracy of the information on the signs, as conditions may change over time. All signs that are damaged, weathered, or for any other reason do not serve their intended purpose should be repaired or replaced according to the sign standards described in this manual.

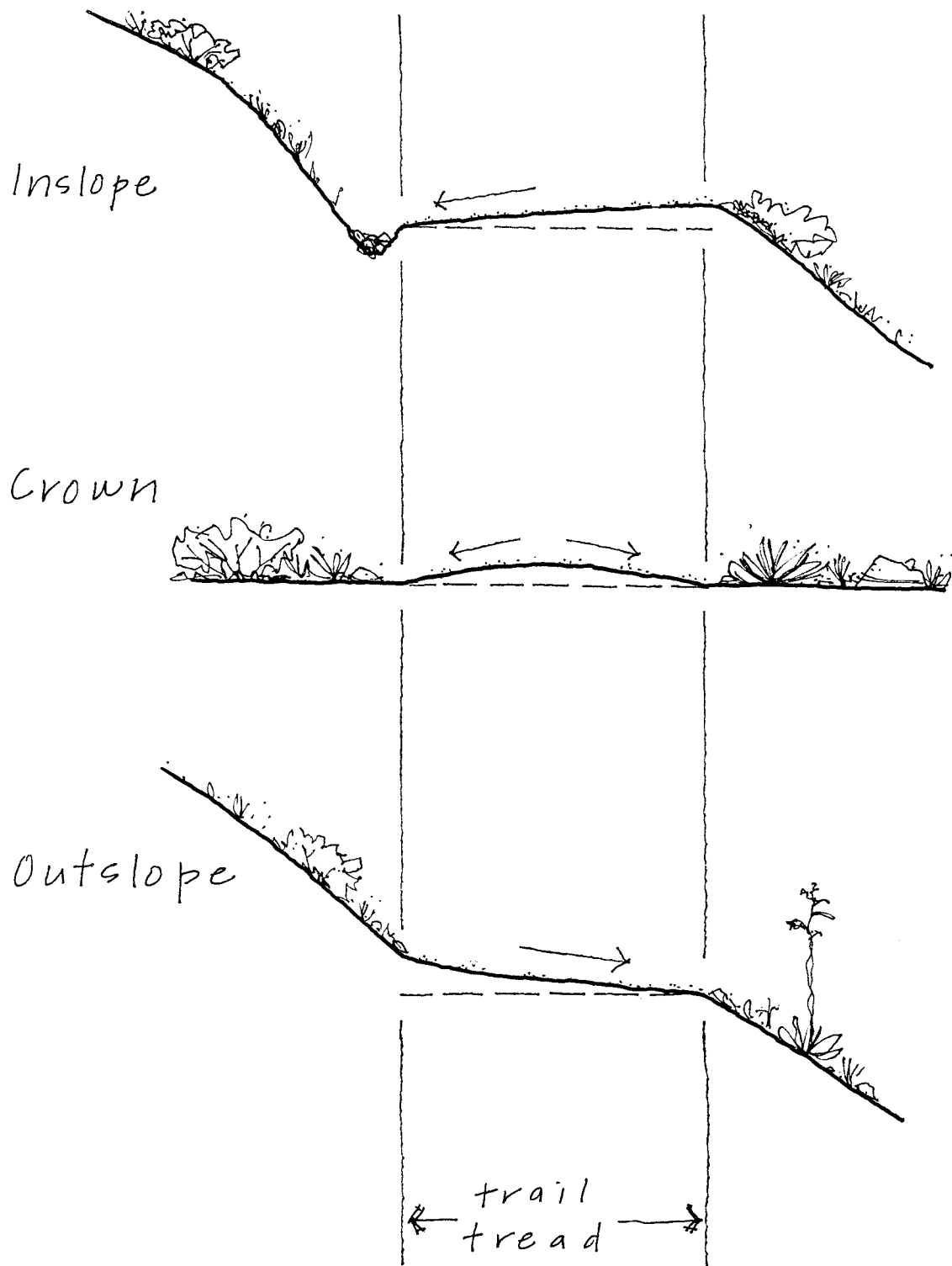


FIGURE 7.3-1
Cross Slopes

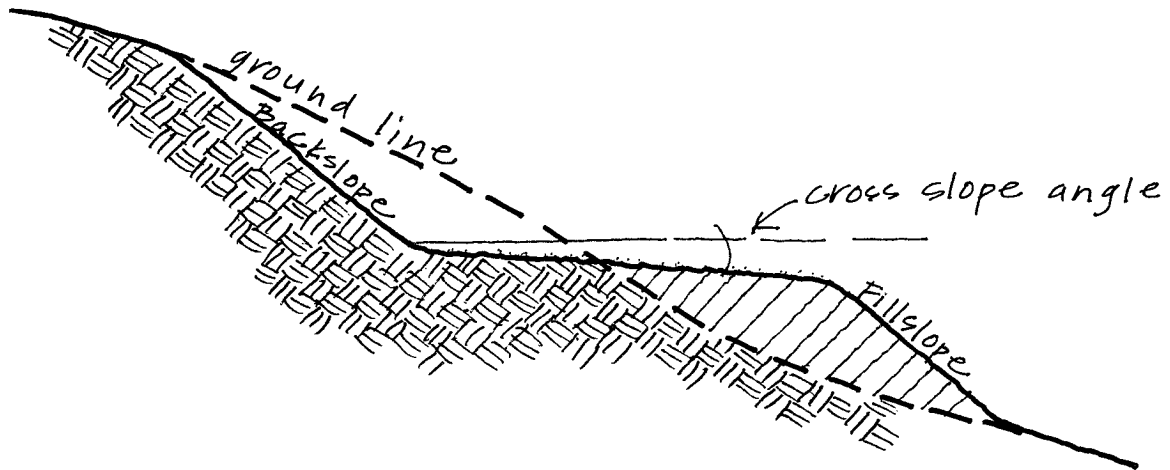


FIGURE 7.3-2

Typical Trail Profile

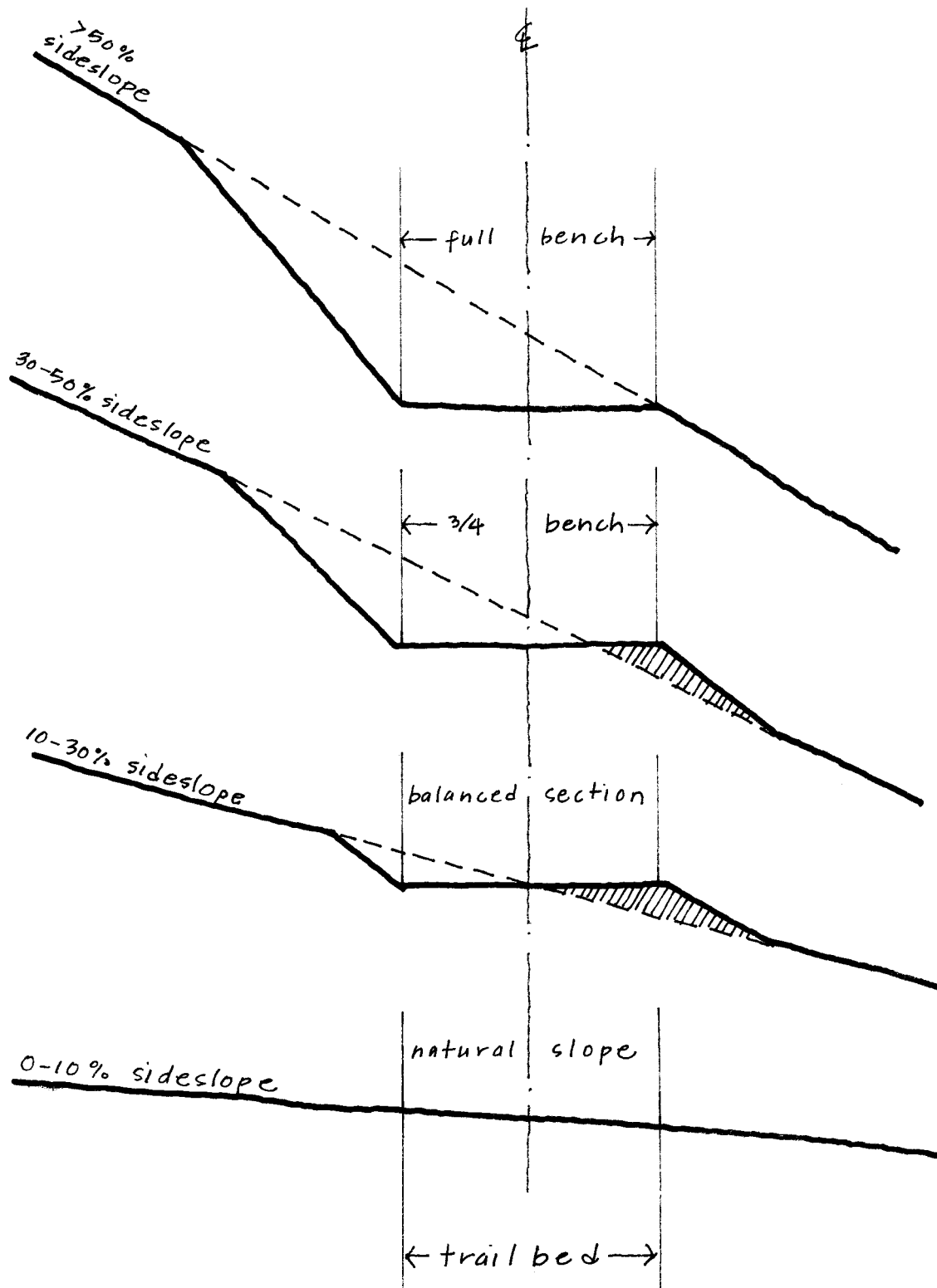


FIGURE 7.3-3
Typical Trail Cross Sections

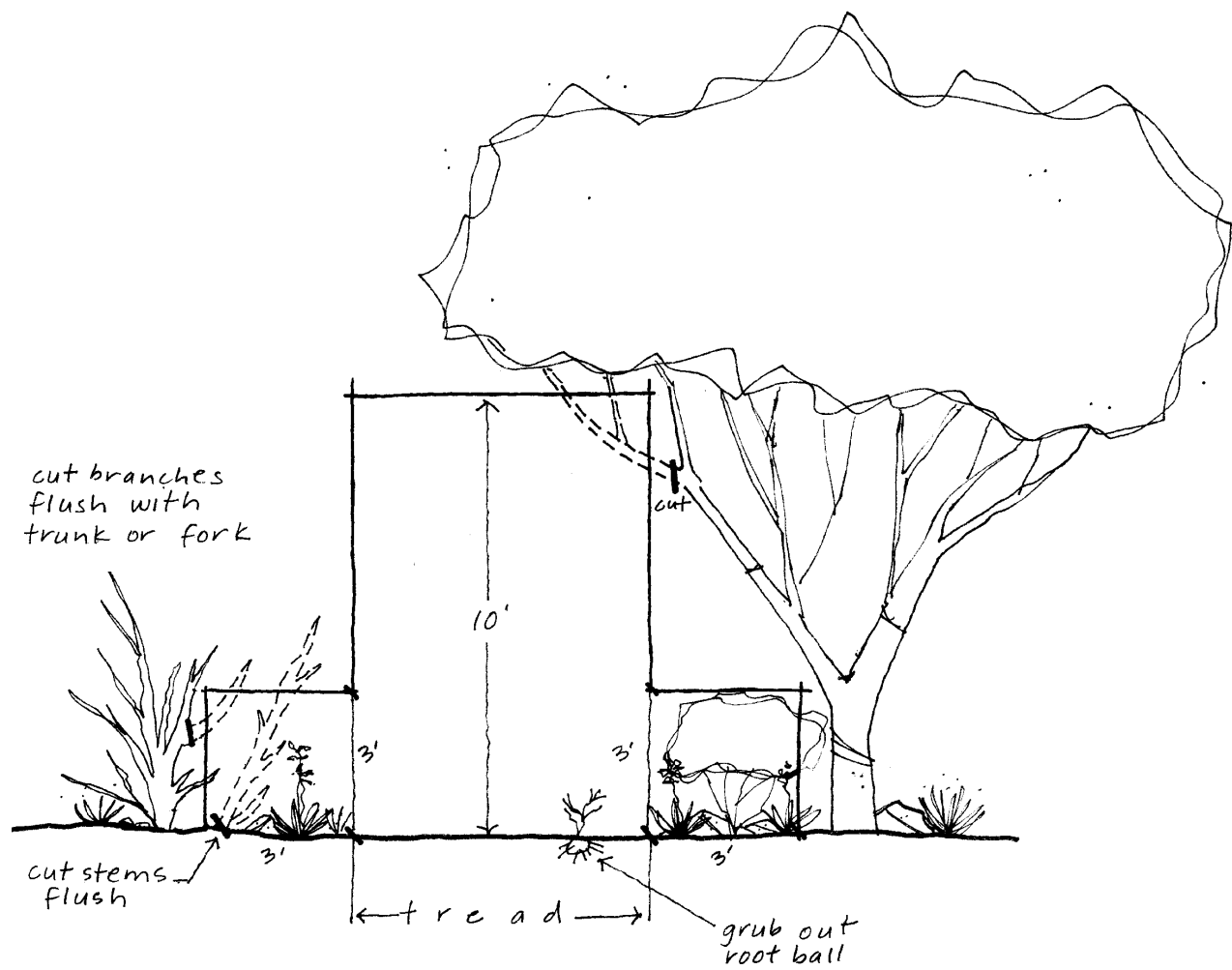


FIGURE 7.3-4
Vegetation Clearance

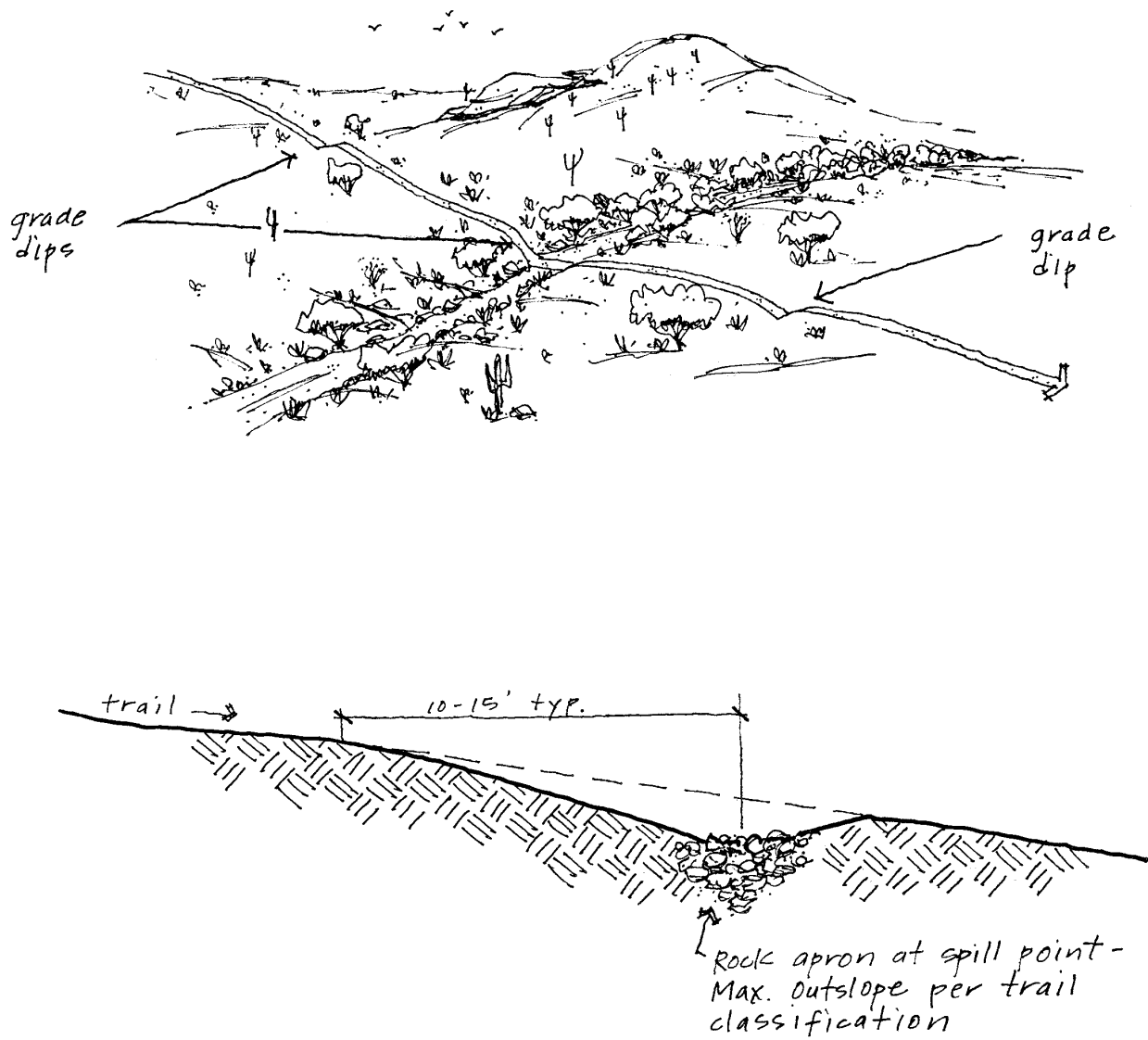


FIGURE 7.3-5

Grade Dips

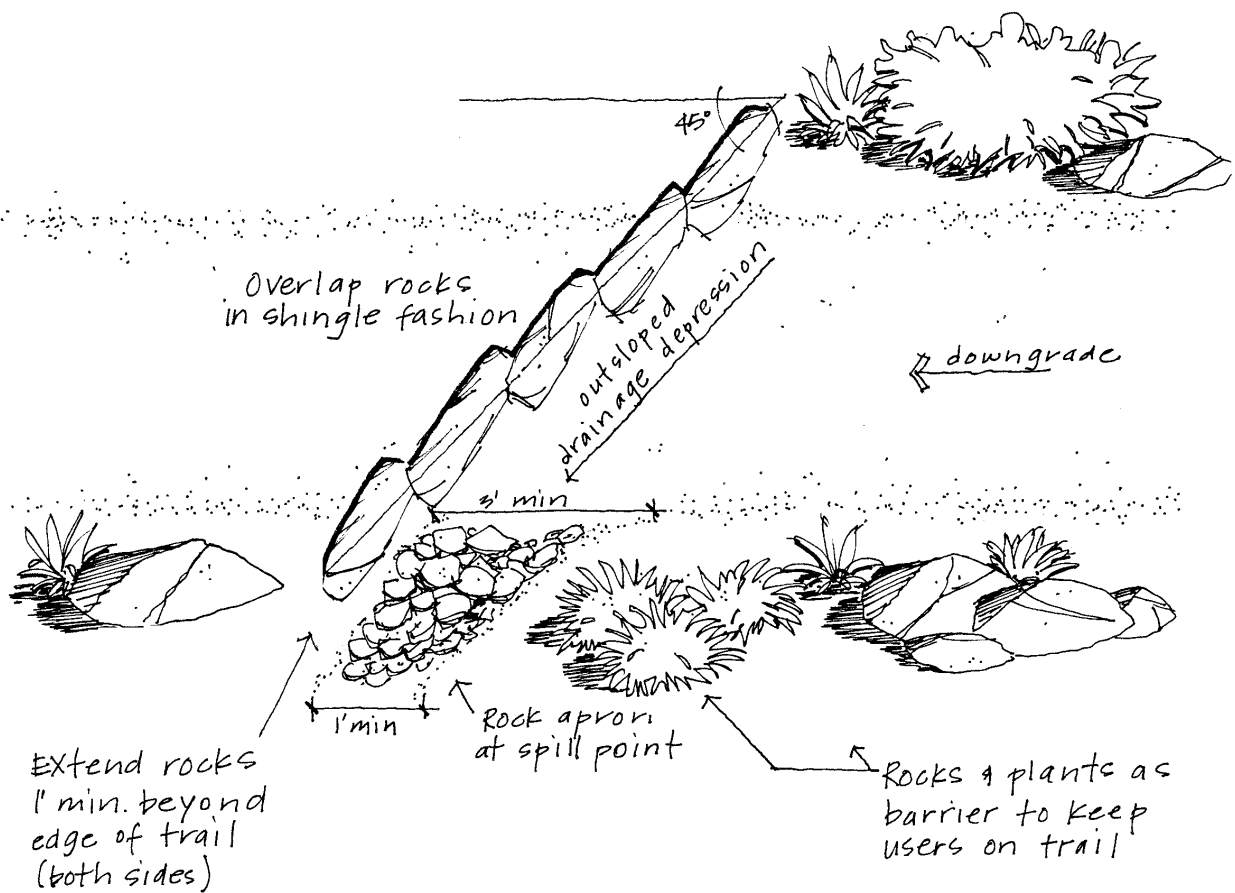
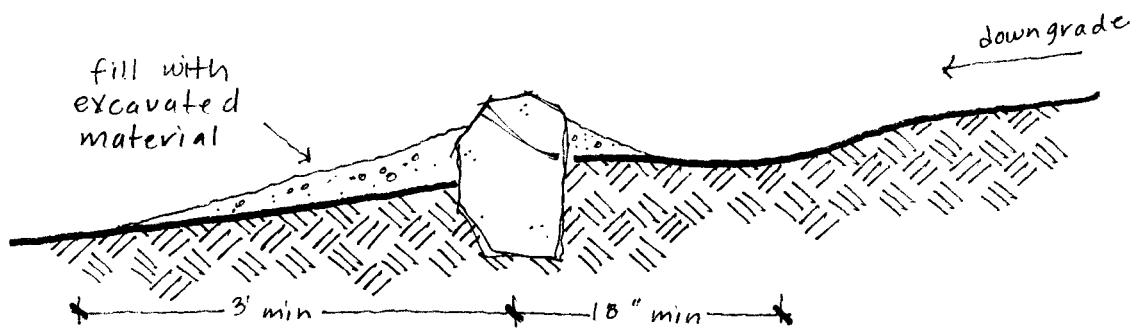


FIGURE 7.3-6

Rock Waterbar

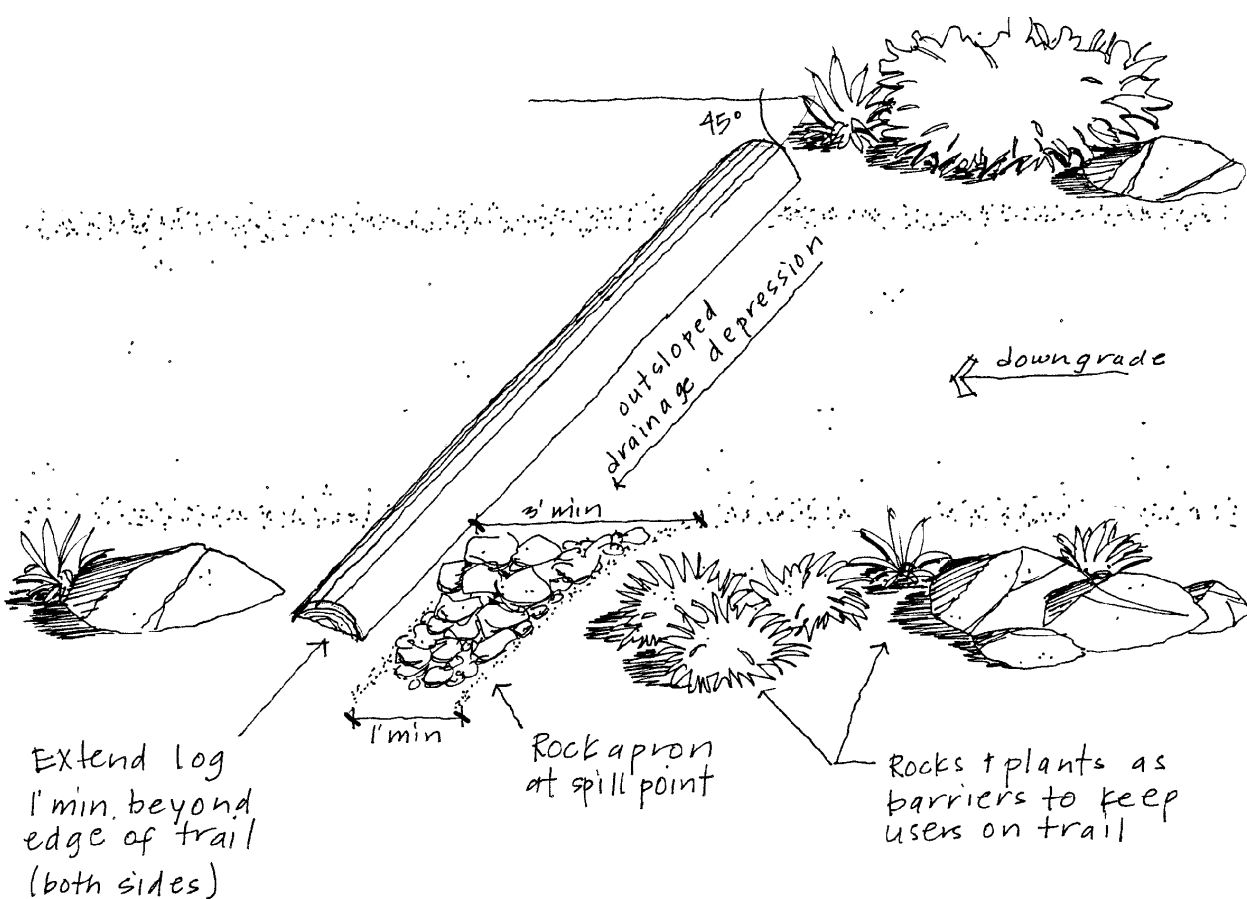
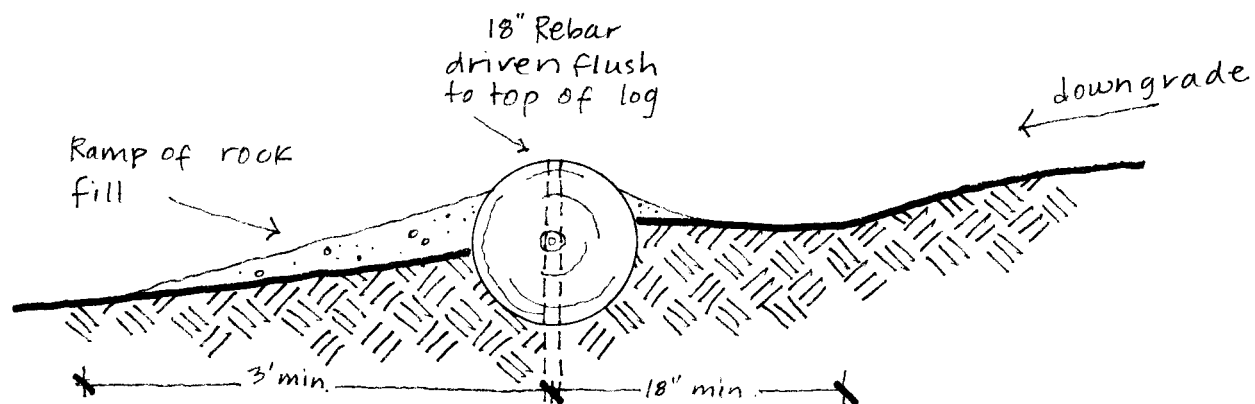


FIGURE 7.3-7

Log Waterbar

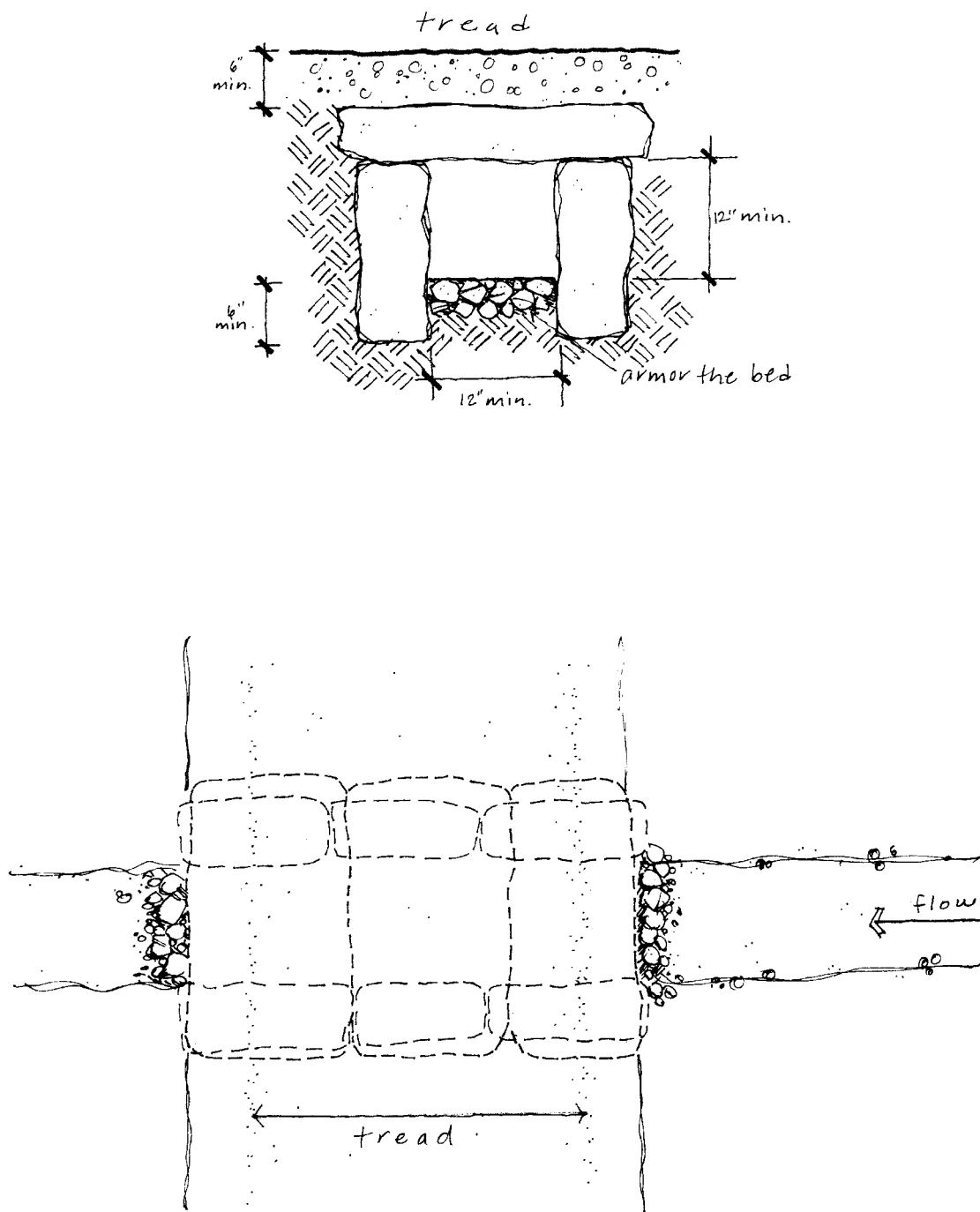


FIGURE 7.3-8
Rock Culvert

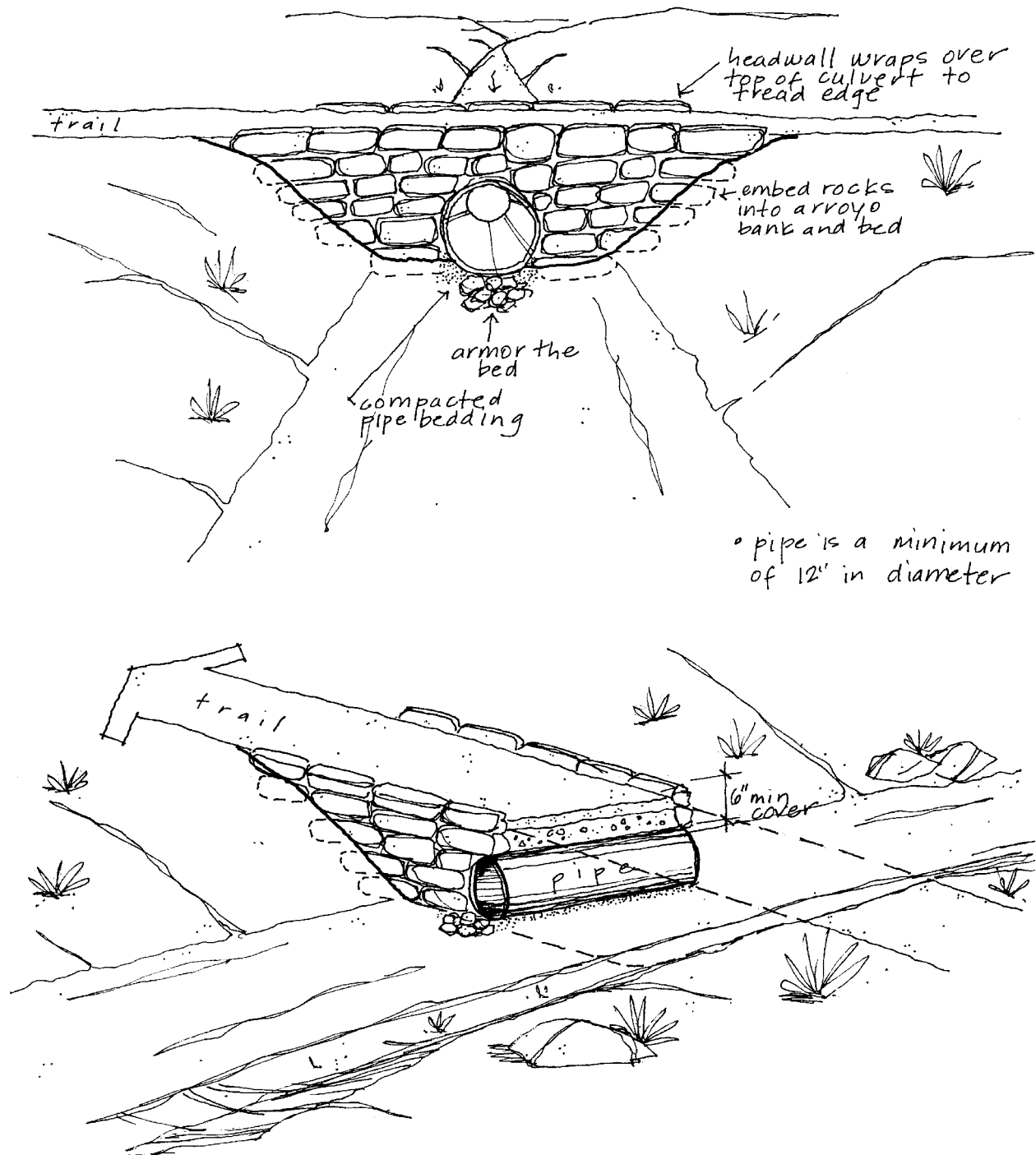


FIGURE 7.3-9

Pipe Culvert

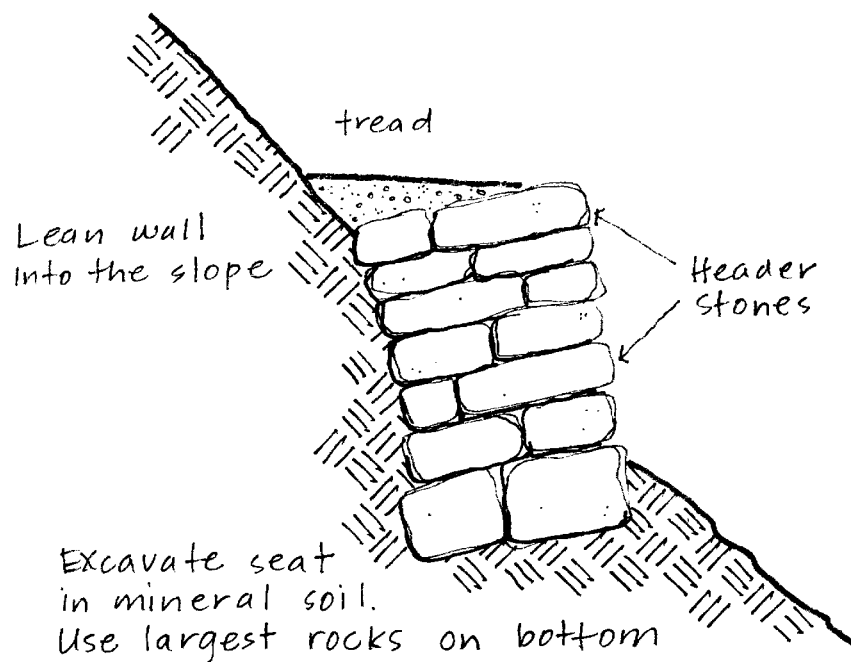
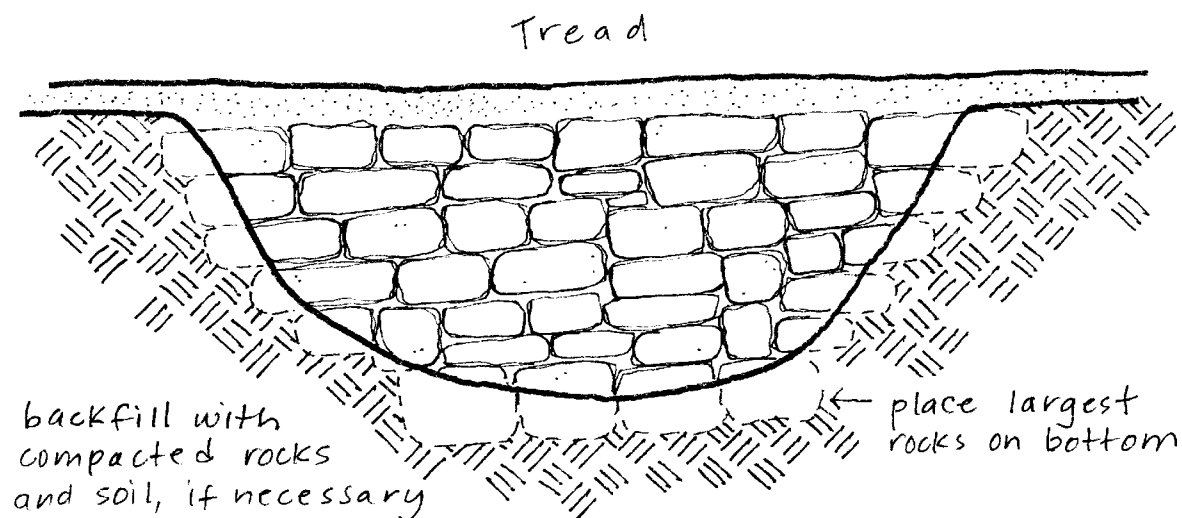


FIGURE 7.3-10
Rock Retaining Wall

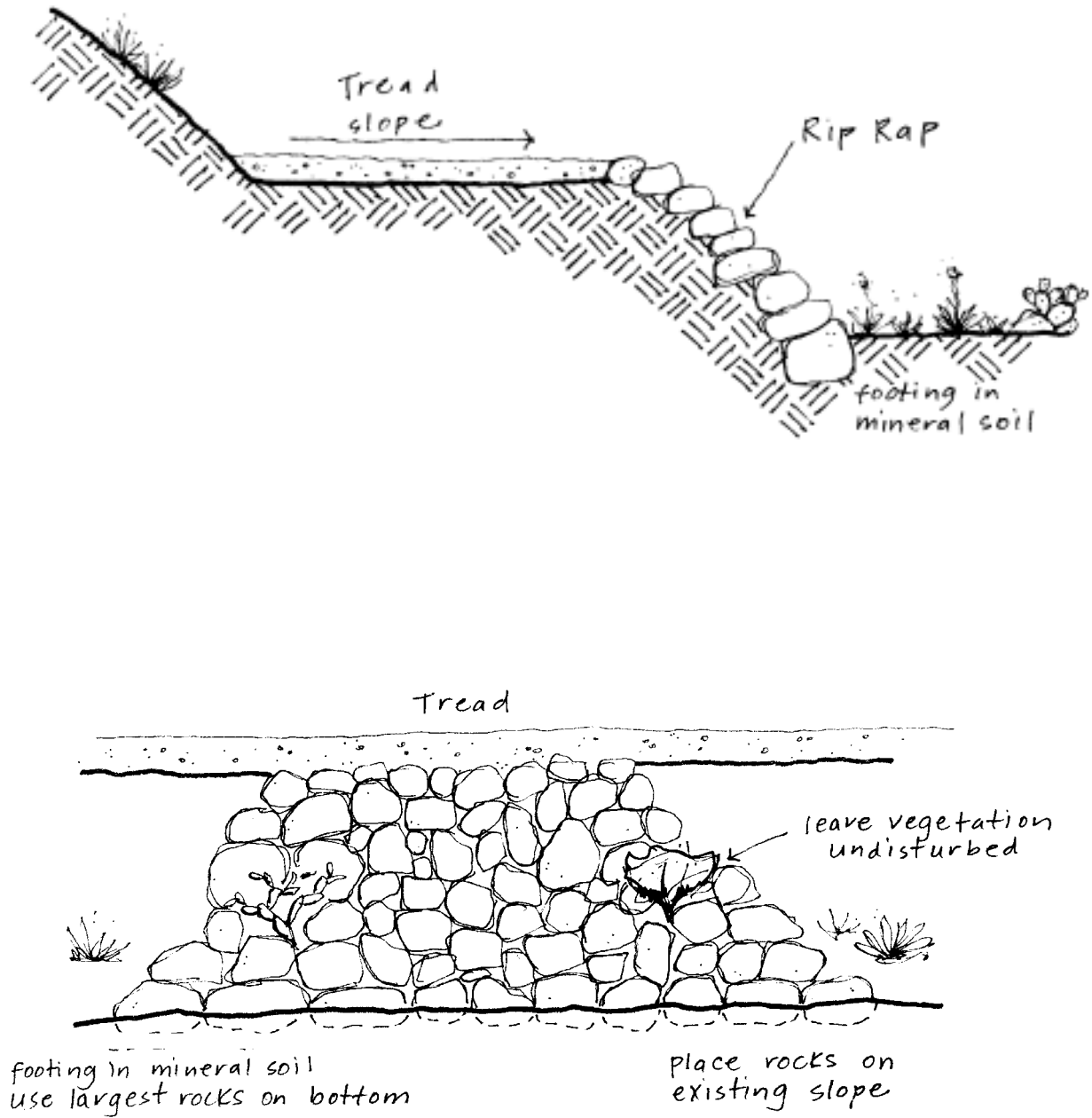


FIGURE 7.3-11

Rip Rap

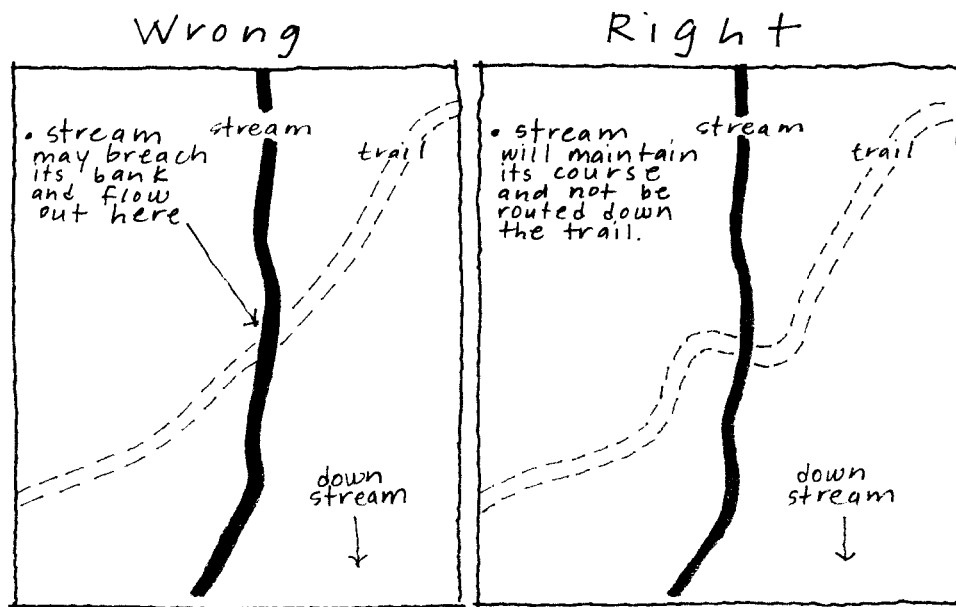
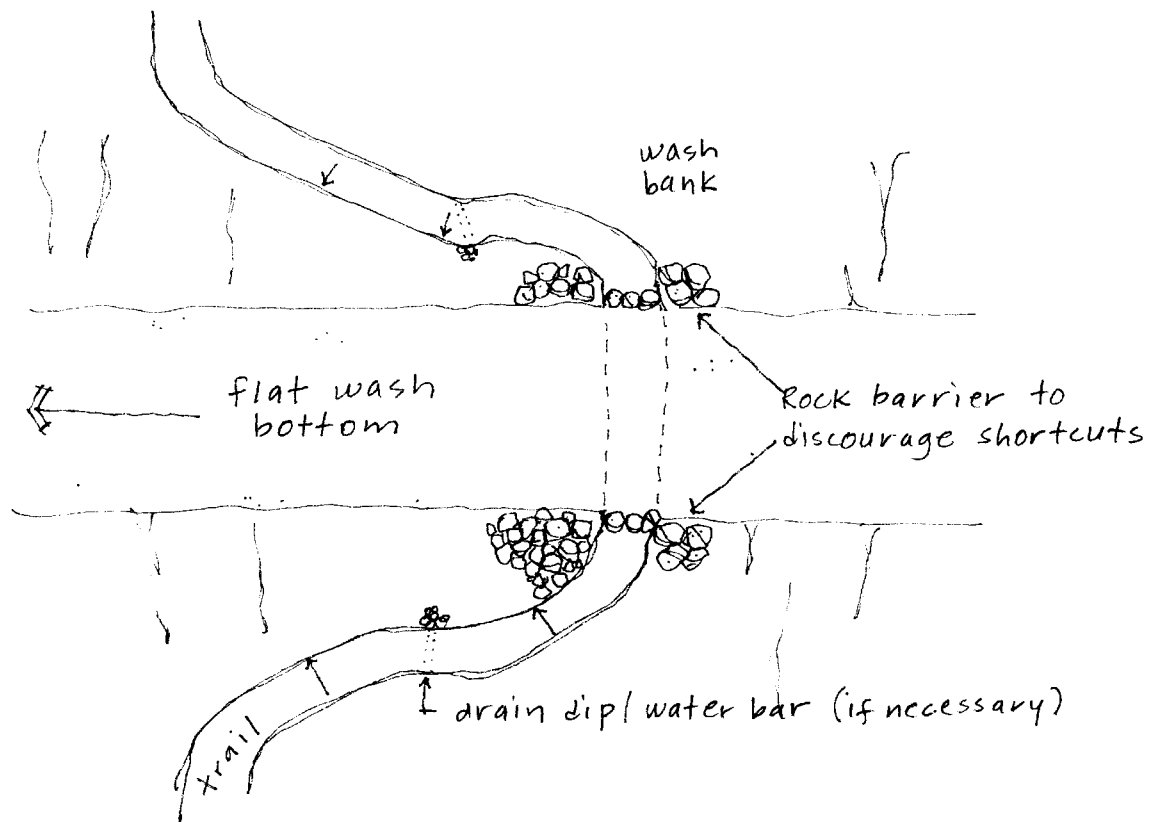


FIGURE 7.3-12

Wash Crossing

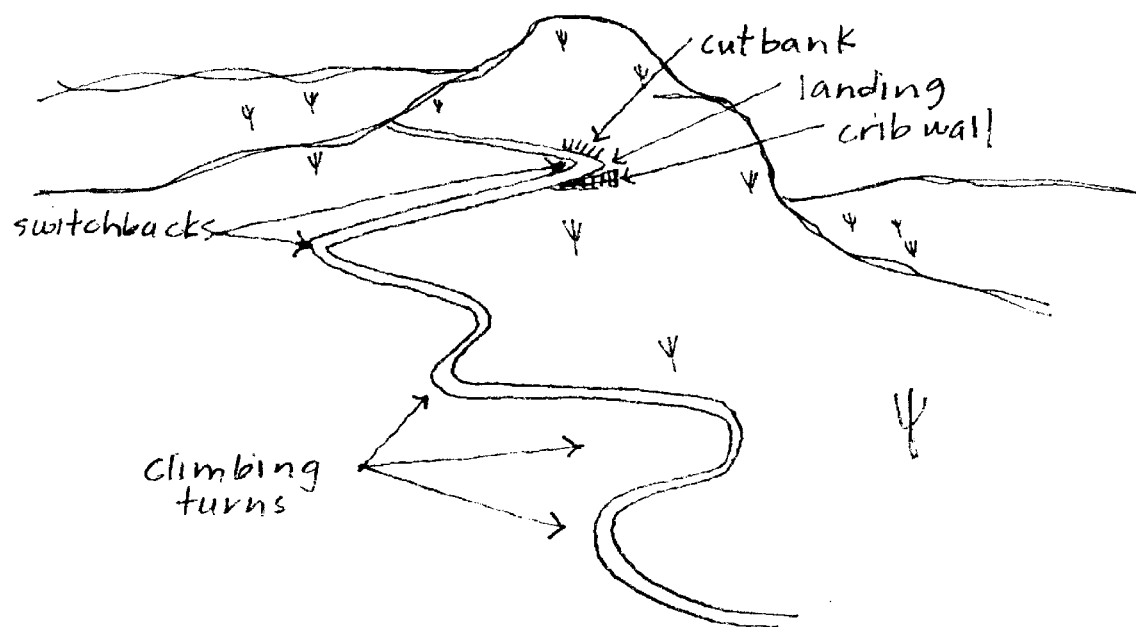


FIGURE 7.3-13

Switchbacks and Climbing Turns Concept

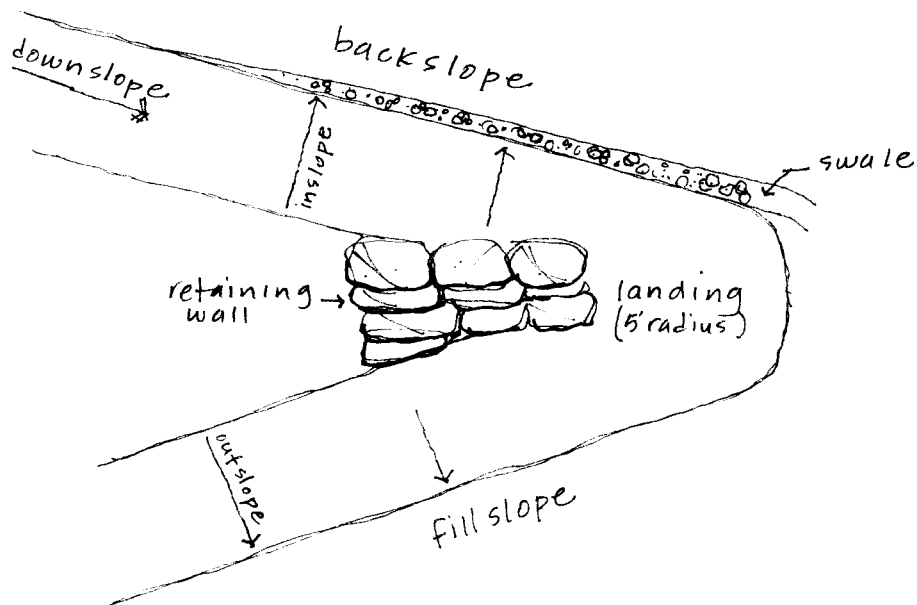
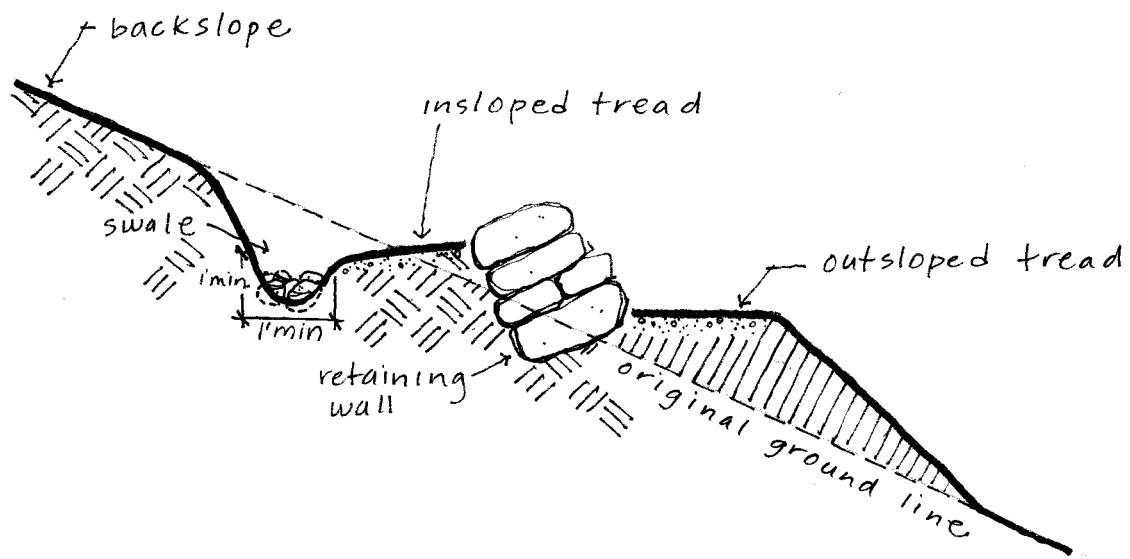


FIGURE 7.3-14
Switchback Turn

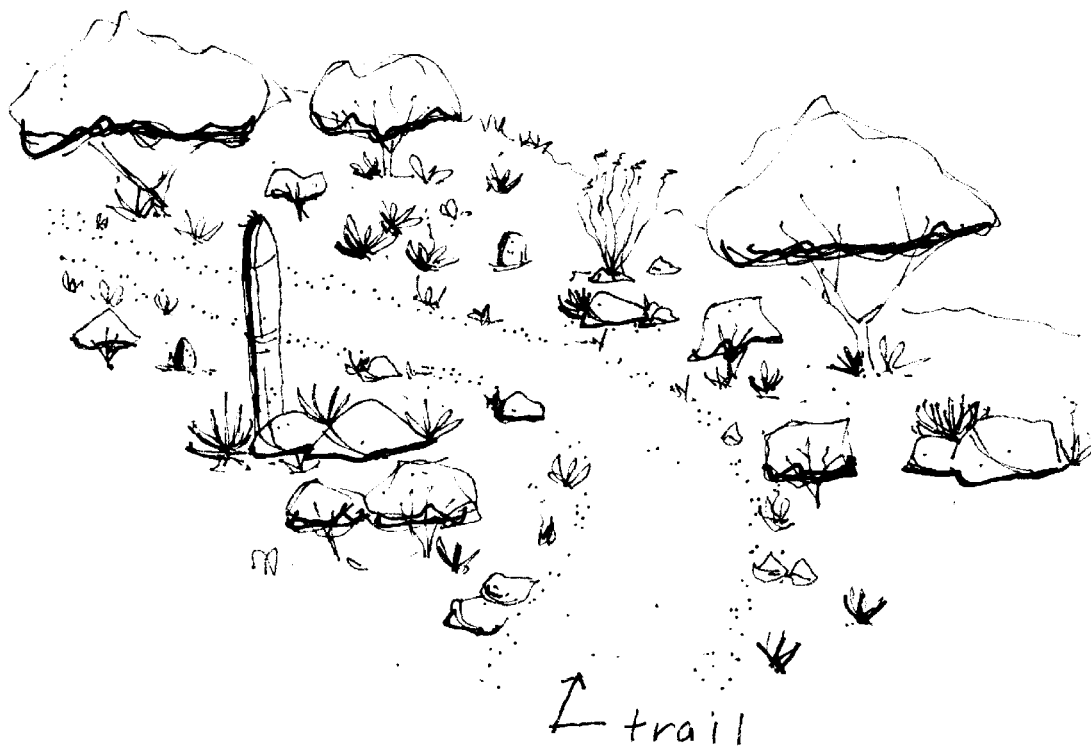


FIGURE 7.3-15
Climbing Turn

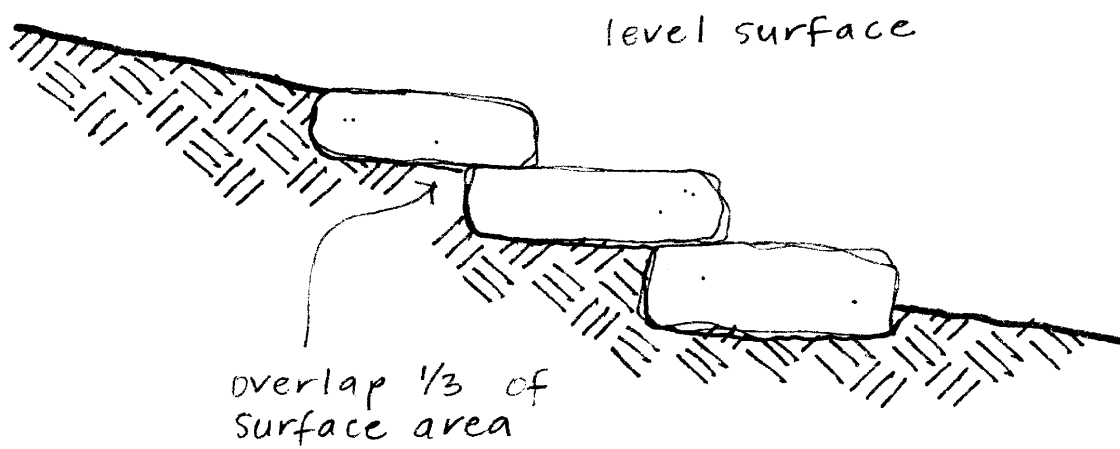
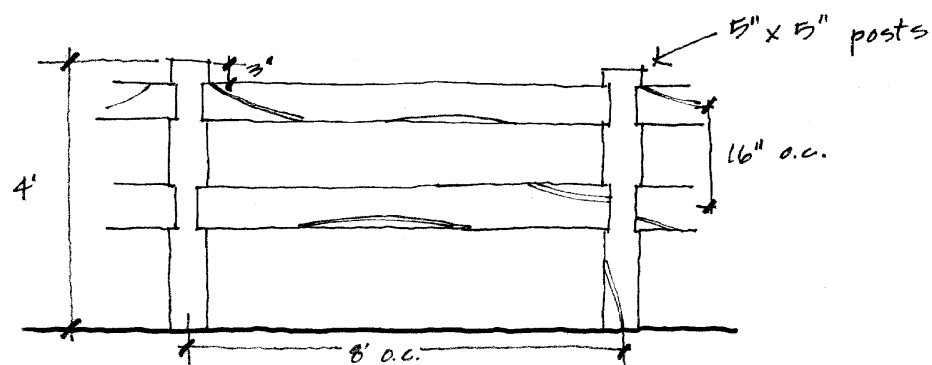


FIGURE 7.3-16

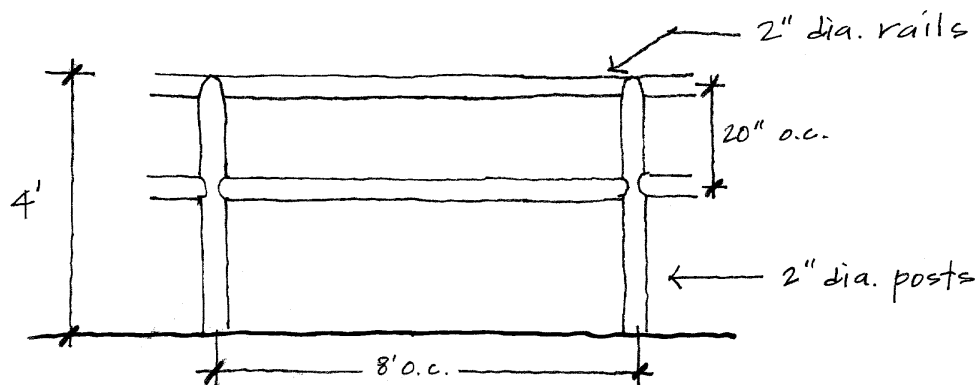
Rock Steps



Dense Landscape



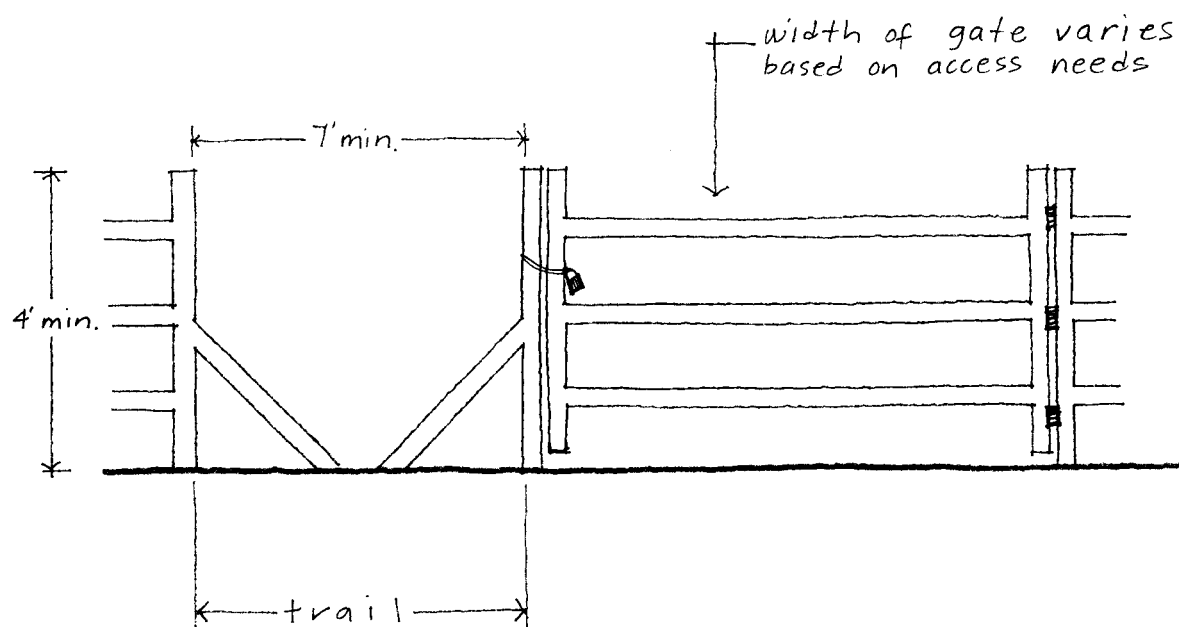
Post and Rail



Pipe Railing

FIGURE 7.3-17

Safety Barriers



Typical Trail Access Gate

FIGURE 7.3-18

Trail Access Gates

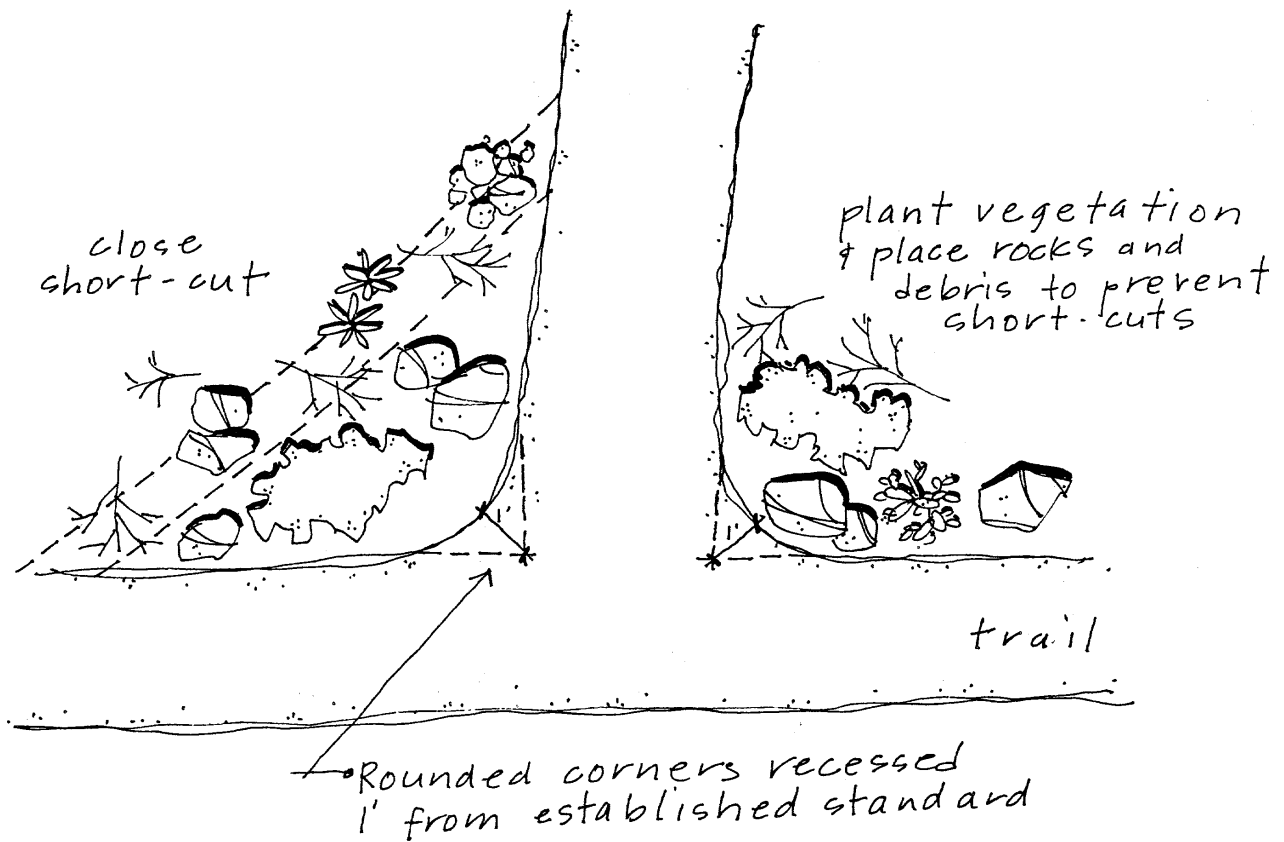
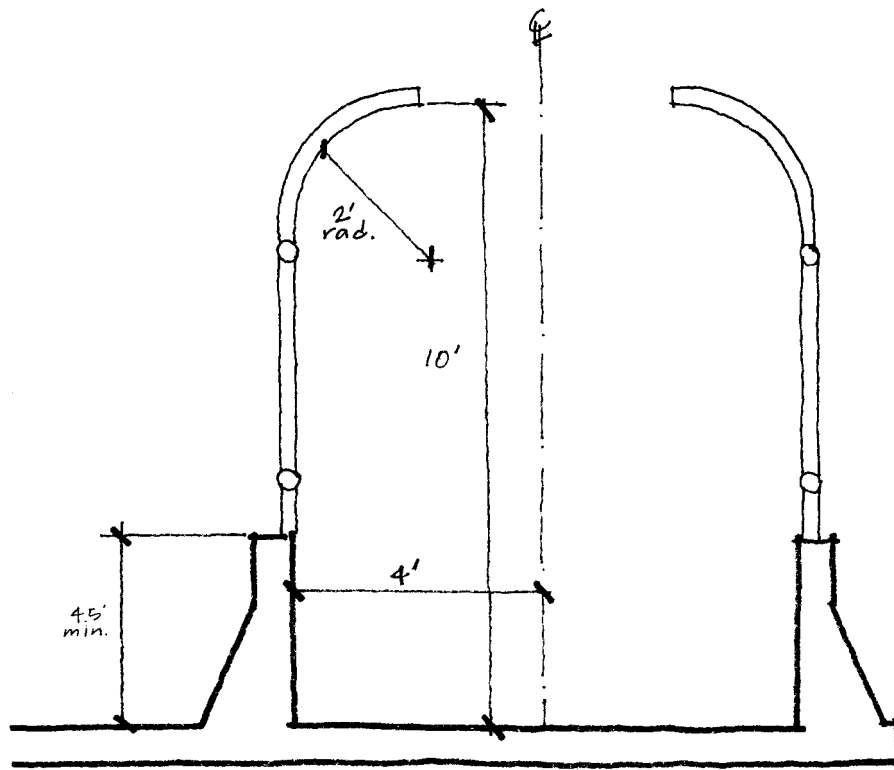
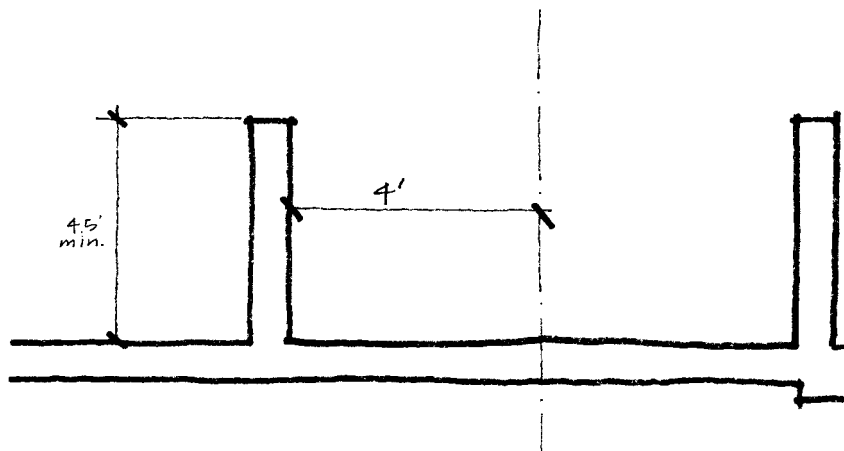


FIGURE 7.3-19

Trail Junctions



Overpass Cross Section



Bridge Cross Section

FIGURE 7.3-20

Trail Overpass and Bridge

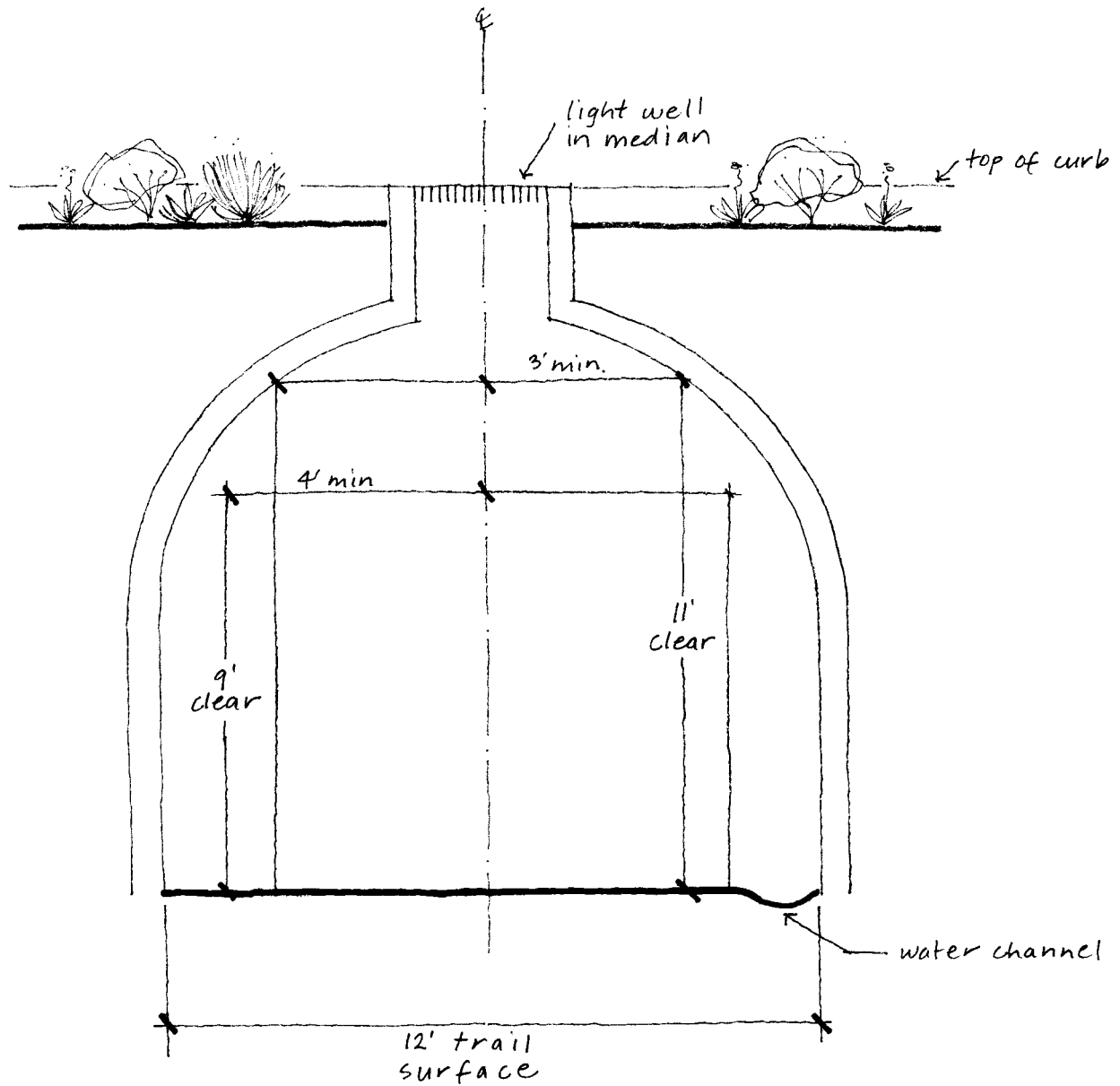
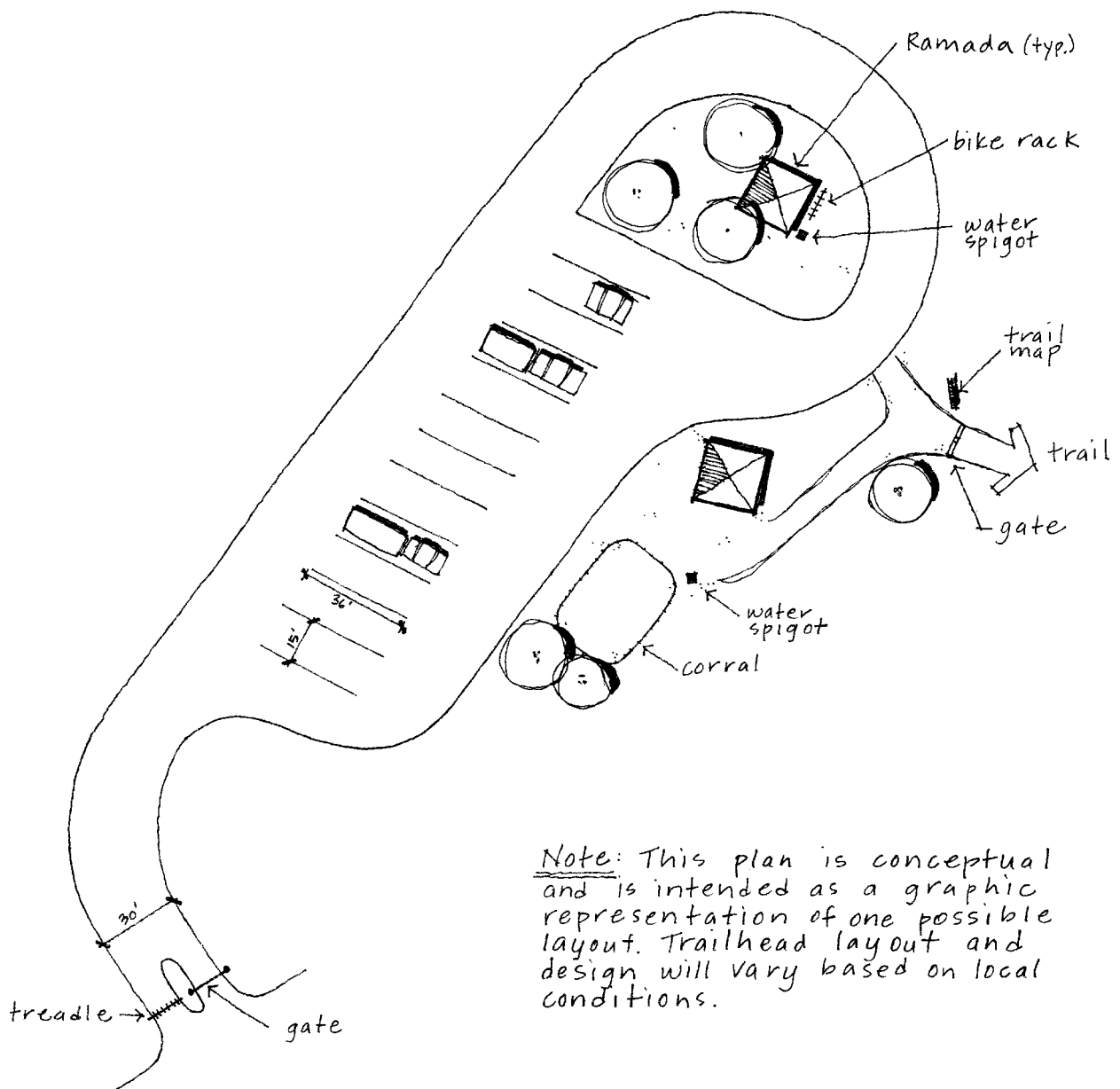


FIGURE 7.3-21
Trail Underpass



Major Trailhead - Conceptual Plan

FIGURE 7.3-22
Trail Access Facility Concept



FIGURE 7.3-23

Trail Sign

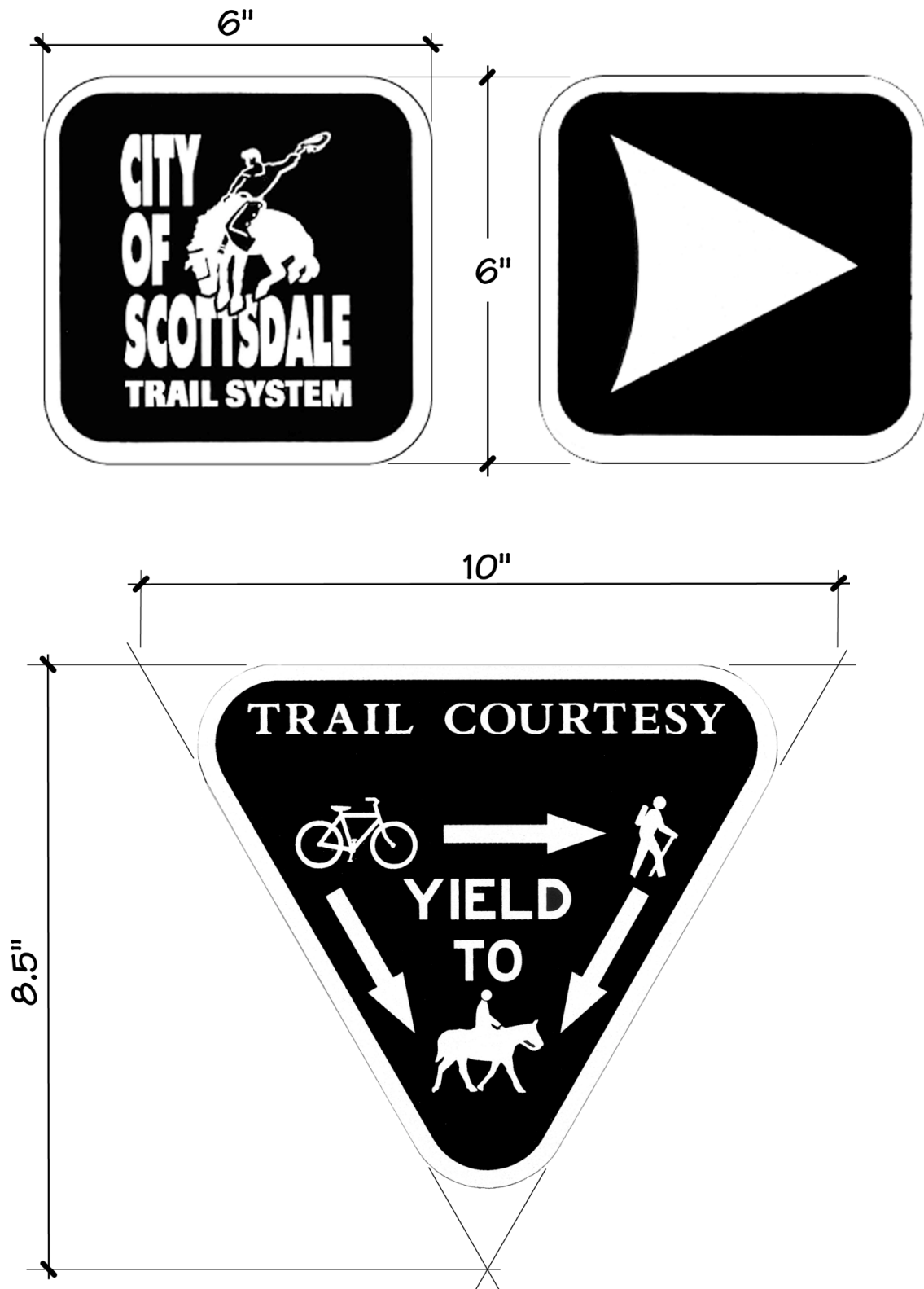


FIGURE 7.3-24

Trail Signs

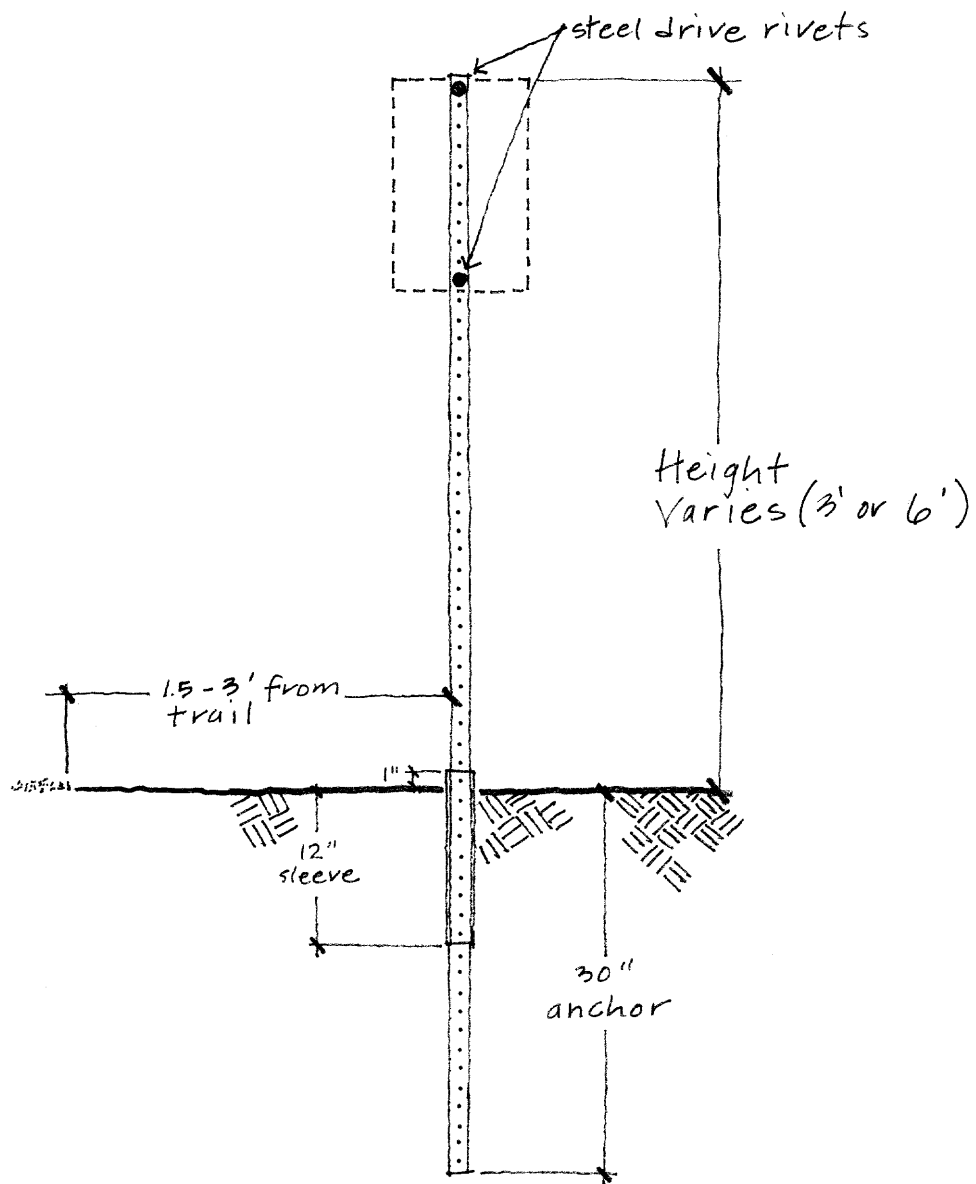
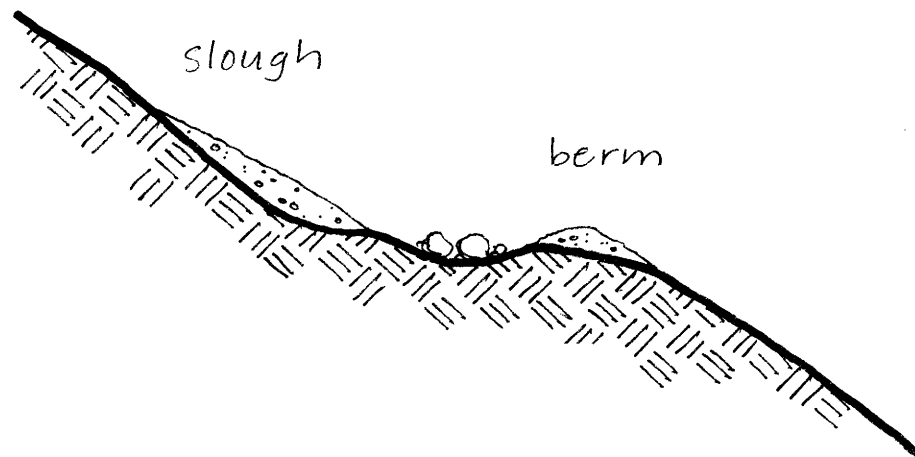


FIGURE 7.3-25
Trail Sign Installation

Before Reconstruction



After Reconstruction

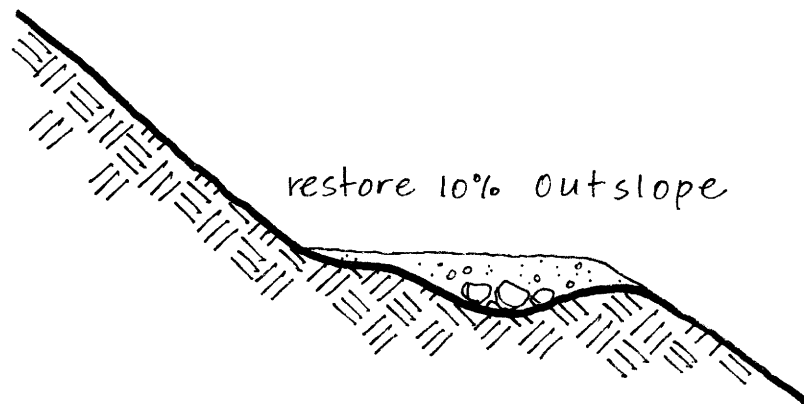


FIGURE 7.3-26

Slough and Berm

Section 7.4

Native Plant Design Standards and Policies Revised April 2000

Chapter 7 Landscaping

SECTION 7.4

NATIVE PLANT

PAGE INDEX

| SECTION | PARAGRAPH TITLE | PAGE |
|----------------|--|-------------|
| 7-401 | GENERAL INFORMATION | |
| | A. Purpose | 3 |
| | B. Definitions | 3 |
| 7-402 | THE NATIVE PLANT PERMIT – SUBMITTAL REQUIREMENTS | |
| | A. Native Plant Application Form | 5 |
| | B. Native Plant Program | 5 |
| | C. Letter of Authorization | 6 |
| | D. Notice of Intent to Clear Land | 6 |
| | E. Tagging Plants in the Field | 6 |
| | F. NAOS exhibit | 7 |
| | G. Review Fee | 7 |
| | H. Prior Approvals | 7 |
| | I. Permit Fee | 7 |
| | J. Field Walk | 7 |
| 7-403 | REVIEW CRITERIA | |
| | A. Density/Intensity of Development | 8 |
| | B. On-site Natural Amenities | 8 |
| | C. Plant Inventory | 8 |
| | D. Revegetation and Natural Density | 8 |
| | E. Excess Plants | 8 |
| | F. Incorporation of Plants Into a Project | 9 |
| | G. Additional Information | 10 |
| 7-404 | INSPECTIONS | |
| | A. Field Walk | 10 |
| | B. Preliminary Site Inspection | 10 |
| | C. Nursery Inspection | 11 |
| | D. Tracking Form | 11 |
| | E. Final Inspection | 11 |
| 7-405 | ACTION ON APPLICATION | 11 |
| 7-406 | QUESTIONS AND ANSWERS | 12 |

| FIGURE | DESCRIPTION | PAGE |
|---------------|---|-------------|
| 7.4-1 | Native Plant Narrative and Application Form | 16 |
| 7.4-2 | Standards for Saguaro Relocation | 17 |
| 7.4-3 | Native Plant Tracking Form | 18 |



Section 7.4 – Native Plant

7-401 GENERAL INFORMATION

A. Purpose

It has been determined that the preservation of the types and sizes of indigenous plant materials specified in Chapter 46 of the Scottsdale Revised Code enhance the City's physical and aesthetic character, increase the valuation of real property, and provide scenic opportunities unique to this region.

The following guidelines have been prepared to assist individuals and companies in compiling the necessary data required to submit for a native plant permit in compliance with Article 5, Chapter 46 of the Scottsdale Revised Code. It is the City's intent that the data gathered be used as part of the preliminary analysis for developing site plans for projects allowing for the preservation of protected plant materials to the greatest extent possible. Particular attention should be paid to specimen plants, dense massings of vegetation, stabilization of soils, and plant materials of a unique character.

B. Definitions

The following definitions shall be applicable to these guidelines.

1. "DESTROY" shall mean to kill, or to cause the death of any protected native plant by any means.
2. "METHODOLOGY" shall mean a written outline of the method or methods to be used to relocate, remove, and/or destroy protected plant material.
3. "MUTILATE" shall mean to deface, maim, damage, or disfigure any protected native plant by shooting, chopping, pushing over, burning, cutting, or any other means.

4. "NATIVE PLANT PERMIT" shall mean a permit issued by the City of Scottsdale pursuant to the provisions of Article 5, Chapter 46 of the Scottsdale Revised Code for the purpose of removing from the premises, or destroying any protected native plant.
5. "NATIVE PLANT PROGRAM" shall mean a development plan specifying the proposed treatment of protected native plants for which a native plant permit is required.
6. "PROTECTED NATIVE PLANT" shall mean cacti which are three (3) feet or greater in height and indigenous trees which are four (4) inches or greater in caliper of the following species:

TREES

| Botanical Name | Common Name |
|--------------------------------|----------------------|
| | |
| <i>Acacia constricta</i> | Whitethorn Acacia |
| <i>Acacia greggii</i> | Catclaw Acacia |
| <i>Berberis haematocarpa</i> | Red Barberry |
| <i>Canotia holocantha</i> | Crucifixion Thorn |
| <i>Celtis pallida</i> | Desert Hackberry |
| <i>Cercidium floridum</i> | Blue Palo Verde |
| <i>Cercidium microphyllum</i> | Foothills Palo Verde |
| <i>Chilopsis linearis</i> | Desert Willow |
| <i>Juniperous mono sperma</i> | One-Seeded Juniper |
| <i>Olneya tesota</i> | Ironwood |
| <i>Populus fremontii</i> | Cottonwood |
| <i>Prosopis spp.</i> | Mesquite |
| <i>Quercus spp.</i> | Scrub Oak |
| <i>Rhus ovata</i> | Sugar Sumac |
| <i>Vauquelinea californica</i> | Arizona Rosewood |

CACTI

| Botanical Name | Common Name |
|-----------------------------|------------------------------|
| | |
| <i>Carnegiea gigantea</i> | Saguaro |
| <i>Ferocactus spp.</i> | Barrel |
| <i>Fouquieria splendens</i> | Ocotillo |
| <i>Peniocereus greggii</i> | Desert Night-Blooming Cereus |
| <i>Yucca elata</i> | Soaptree Yucca |

7. "RELOCATE" shall mean to transplant a protected native plant to another location on the premises.
8. "REMOVE" shall mean to transport a protected native plant from the premises on which it has been growing for the purpose of transplanting it on another site.
9. "SPECIMEN" shall mean a plant that is relatively free of disease and physical deformations and is representative of the form and character of the species.
10. "UNSALVAGEABLE PLANT" shall mean a protected native plant that cannot be successfully relocated due to any of the following:
 - a. Deteriorated health from disease, infestation, or natural causes.
 - b. Physical constraints related to plant location, soil conditions, orientation, or general conditions that obstruct and/or prevent the application of city-approved relocation techniques.
11. "NATIVE PLANT" shall mean any plant listed on the City of Scottsdale protected native plant list as defined in Sec. 46-105 of the Scottsdale Revised Code.

7-402 THE NATIVE PLANT PERMIT – SUBMITTAL REQUIREMENTS

No protected plant material, as defined in Section 7-401.6 "Protected Native Plant" of this manual, may be relocated, removed, or destroyed without a native plant permit. No native plant permit shall be issued unless an application is submitted in conjunction with an existing or proposed development which requires development review board approval, city council approval, board of adjustment, or approval of a plat as determined by the city manager or designee. The submittal is separate from any other native plant submittal required for a Zoning Case, a Development Review Board Case, or a Preliminary Plat Case. For a native plant permit to be issued, the following items must be submitted to the Development Services Department (One Stop Shop) of the City of Scottsdale at 7447 E. Indian School Road, Suite 100. Submittals made with no action taken will be purged from the system after one year.

A. Native Plant Application Form.

A completed Native Plant Narrative and Application Form – see Figure 7.4-1 of this manual. *

B. Native Plant Program

A complete Native Plant Program with the following information, as outlined in Section 7.504 of the Scottsdale Zoning Ordinance:

1. Three (3) copies of a native plant inventory on an aerial photograph with a project overlay, or a site plan. The location of all protected native plants within the construction boundaries, and an additional fifty (50) foot buffer beyond the construction limits, or to the edge of the property, are to be shown on the plan.

a. The aerial or site plan shall include the project name, a scale (minimum scale is 1" = 50'), a north arrow, a vicinity map, the adjacent street names, and the name of the company performing the inventory.

2. A list identifying the tag number, species, size, general condition, and salvage status of each protected plant within the area of disturbance. If a plant is noted as non-salvageable, the reason or reasons for the assessment must also be noted.

3. A salvage contractor must have prior methodology approval by City staff. No native plant inventory will be accepted if it is not performed by a City of Scottsdale approved salvage contractor. If the cactus salvage contractor is different than the tree salvage contractor, both will need to be reviewed and approved.

a. Due to the large number of Saguaros which have expired after being transplanted, and the length of time for the decline of the plant to be identified; the City, in conjunction with the Desert Botanical Garden, has established baseline standards for Saguaro relocation (see Figure 7.4-2 of this manual). Any deviation from an approved methodology or the Standards for Saguaro relocation shall require prior City review and approval.

4. A relocation program identifying the ultimate use and placement of salvaged plant material including any proposals for plants to be removed from the project. *

5. Nursery location for storage of salvaged plants.

C. Letter of Authorization.

A letter of authorization from the property owner identifying a salvage contractor approved by the City. For single family home submittals, the name of the salvage contractor shall be noted on the native plant portion of the planning submittal. All inventories must be performed by a city-approved salvage contractor.

D. Notice of Intent to Clear Land.

A copy of the stamped "Arizona Department of Agriculture Notice of Intent to Clear Land" form. To obtain the form contact the Arizona Department of Agriculture, Native Plant Section at (602)542-3292 or visit their website at www.agriculture.state.az.us. *

E. Notice of Tagging of Plants in the Field.

Notice that all protected plants have been tagged and numbered in the field in conformance with Section 46-116 of the Scottsdale Revised Code.

1. White tag for plants remaining in place.
2. Red tag for plants being relocated/removed.
3. Blue tag for plants being destroyed.

Plants with white tags or no tags shall be protected for the duration of the project regardless of salvage status. Tags shall be numbered to correspond to the inventory numbering. In addition, construction boundaries, NAOS (Natural Area Open Space), and other areas required to be left undisturbed, are to be clearly staked in the field with yellow nylon rope or other means approved by the Planning Inspector for the project.

F. Natural Area Open Space exhibit for site

A copy of the N.A.O.S. exhibit for the site, showing locations of both natural and revegetated areas to be dedicated. All N.A.O.S. easements must be staked and roped in the field at the time of the native plant field walk.

G. Review Fee.

An initial review fee of fifty (\$50) dollars is charged for the first hour in review. Additional hours required for the review will be charged at fifty (\$50) dollars per hour at the time the permit is issued. For single family homes, this fee is included as part of the planning site plan review fee.

H. Prior Approvals.

If a project requires approval from the Development Review Board, the City Council, the Board of Adjustment or approval of a plat, the native plant permit shall not be issued until all necessary prior approvals have been issued by the above mentioned boards and council. This includes single family homes going thorough these processes. The native plant permit for all single family custom homes will be issued concurrent with the building permit.

I. Permit Fee.

At the time a permit is issued, a fee of twenty-five (\$25) dollars plus one (\$1) dollar for each native plant to be removed, relocated, or destroyed; shall be paid to the City. An

Administrative Fee of seventy-five (\$75) dollars will also be added to the cost of each permit.

J. Field Walk.

Once the submittal has been made for commercial development, plats, and miscellaneous projects, City staff will schedule a field walk to verify inventory accuracy and plant location in relation to the project design. For single family homes, this review may be done at the time of the Preliminary Site Inspection after the permit has been issued.

* Items not required for individual single family custom-built homes.

7-403 REVIEW CRITERIA

In conformance with Section 7.503 of the Scottsdale Zoning Ordinance, no native plant program shall be approved until it has been demonstrated that the following criteria have been considered:

A. Density/Intensity of Development.

The density/intensity of development for the approved land use shall be an important element in the determination of the base requirements for plant retention and salvage. The proposed Relocation Program shall provide reasonable plant salvage, protection, and storage; and shall ensure consistency with existing neighborhood character.

B. On-Site Natural Amenities.

The site plans shall be designed to protect and incorporate significant on-site natural amenities (i.e. aesthetic, unique, historic, etc.) These relationships shall promote and enhance the character of the native environment rather than contrast with or domesticate it.

C. Plant Inventory.

A vegetation inventory and analysis shall provide a clear comprehensive overview and listing of plant material, their condition, and their physical relationship on-site so as to aid the site planning and determination of plant salvageability.

D. Revegetation and Natural Density.

A conceptual analysis and design of the site revegetation and/or landscaping shall ensure that the character of the project is consistent with the natural density, distribution, and maturity of the vegetation on the adjacent properties.

E. Excess Plants.

Should the conceptual analysis design reveal an excess supply of on-site salvageable plants, the relocation program shall propose alternative projects within the city where the salvaged plants may be relocated.

F. Incorporation of Plants in a Project.

Incorporation of plant material into site design shall take into consideration the following:

1. Conditions where protected plants should remain in place:
 - a. Along natural washes where exposed roots, erosive soils, and steep slopes often make relocating plants difficult.
 - b. Where dense massing of plant materials provides an aesthetic setting, but individual plants may be unsalvageable.
 - c. In boulder outcroppings where digging out the root ball would be impractical.
 - d. Where unstable soils decrease the ability of the root ball to hold together.
 - e. Large specimen material which does not lend itself to relocation.
 - f. When seasonal conditions reduce the salvageability rate to the point of making relocation undesirable.
 - g. When plants occur in a unique grouping or form.
 - h. When plants are located within designated scenic and vista corridors.
 - i. Within land use buffers.
2. Conditions where protected plants may be relocated
 - a. When retention of protected plant material is impractical due to reasonable construction, physical conditions which are good, and plant material which falls within the construction boundaries.
3. Conditions where protected plants may be removed from the site:
 - a. When the density allowed on a site is high with minimal areas for placing plant material back on the project
 - b. When conditions yield more plant materials than can be used back on the project.

In these cases, it is anticipated that part of the native plant program will include making the excess plant material available to other projects or interested salvage contractors, preferably for use within the city. In order to remove any protected plant material from a site, the persons removing the protected plants shall submit to the City Manager or his designee a plan demonstrating that one or more of the conditions noted above exists, and that all State of Arizona requirements have been met.

4. When protected plant materials may be destroyed:

- a. When the physical condition of a protected plant is poor due to disease, infestation, mutilation, age, or poor natural conditions; and it is located within the construction boundaries.
- b. If a protected plant is involved in a safety issue and it cannot be relocated, removed, or protected in place.

G. Additional Information

In addition to the criteria mentioned above, other items which may be requested to ensure compliance with the Scottsdale Zoning Ordinance as follows:

1. Topographic map with contours at a minimum of five (5) feet intervals to show steep slopes.
2. Identification of natural features such as bedrock and boulder outcroppings.
3. General information on the soil types which exist on the site.
4. Drainage patterns of all washes carrying fifty (50) c.f.s. or greater.
5. Zoning of all adjacent properties.
6. Location of all dedications and easements both on the property and adjacent to it including, but not limited to: Natural Area Open Space easements, drainage easements, right-of-way dedications, etc.
7. Proposed site plan as it relates to all of the above and including, but not limited to the following:
 - a. Street alignments
 - b. Driveways locations
 - c. Areas to be revegetated.
 - d. Parking areas

7-404 INSPECTIONS

The following inspections shall be made by City staff during the permit review process and the construction of the project:

A. Field Walk

The field walk is part of the first review of the Native Plant Program for commercial developments, plats, and miscellaneous projects. For single family homes, the field walk is part of the Preliminary Site Inspection. The purpose of the field walk is to verify the accuracy of the native plant inventory and to identify other items that may allow for the greatest preservation of protected plant material.

B. Preliminary Site Inspection.

A Preliminary Site Inspection (#42 Pre-Site Inspection) shall take place once a Native Plant Permit has been issued, but prior to the commencement of any salvage activities. At the time of this inspection, the applicant must present the copy of the approved Native Plant Program stamped "Planning Inspectors Copy", and a copy of the permit. A permit inspection card, also issued with the permit, shall be posted on the site at all times.

C. Nursery Inspection

The Nursery Inspection is to assess the actual results of the relocation process. It is to take place one to two weeks after the last of the relocated plant materials have been placed in the nursery. The plant ID number from the inventory list shall be clearly marked on the box or plant. The inspection shall be arranged with the Inspection Services Division by calling (480) 312-5750.

D. Native Plant Tracking Form.

The purpose of the Native Plant Tracking Form, (see Figure 7.4-3 of this manual) is to track the overall success ratios of protected plants that have been salvaged. These numbers are being quantified as part of the City of Scottsdale's Sustainability Indicators Project. The tracking form may be submitted to the Planning Inspector. Any project which requires a native plant permit needs to submit a tracking form. The tracking form must be submitted within three months from the commencement of salvage operations and prior to the issuance of the Certificate of Occupancy.

E. Final Inspection.

This inspection is to verify the ultimate location of relocated plant material and should be done in conjunction with final inspections for receiving the Certificate of Occupancy by calling (480) 312-5750.

7-405 ACTION ON APPLICATIONS

Upon submittal of an application for a Native Plant Permit, City staff may take one of three courses of action:

1. The application may be approved and the permit issued.
2. The application may be approved with conditions and the permit issued.
3. The application may be denied with conditions for approval.

Action taken on an application may be appealed to the Development Review Board in conformance with the procedures in Section 7.500 of the Scottsdale Zoning Ordinance. Submittals that are not acted upon within one year, will be purged from the system and any fees paid will not be refundable.

QUESTIONS AND ANSWERS

The following are answers to questions which are commonly asked about Native Plant Programs and Inventories:

A. What is a Native Plant Inventory?

The Native Plant Inventory is the identification of all native plants on a site protected by the Native Plant Ordinance. It is to contain, but is not limited to, the following items:

1. An aerial photograph with site plan overlay showing the location of all protected native plants within the proposed construction boundaries and within a fifty (50) foot buffer extending parallel to the boundary lines. These plans shall have a minimum scale of one inch equals fifty feet (1" = 50').
2. An inventory list, usually on 8 ½" x 11" sheets, identifying the species, size, general condition, and salvage status information for each specific plant located on the aerial photograph or site plan overlay noted above.
 - a. The species shall be listed by both botanical and common names.
 - b. The size of trees shall be in caliper inches and the size of cacti shall be in feet of height
 - c. General condition of the plant shall identify the salvageability of each specific plant. If a plant is not considered salvageable, the reason for the determination is to be noted.
 - d. Salvage status shall indicate what is going to happen to that plant – if it is to remain in place, to be relocated, or to be destroyed.

B. What standard is used to measure a tree's trunk diameter?

In order to measure the trunk of a tree, it must first be determined whether the tree is a single-trunk or a multi-trunk tree.

1. A single trunk tree shall mean a tree with a single trunk protruding above grade attached to a single root ball. The diameter of single-trunk trees shall be

measured at a point twelve (12) inches above grade. If the tree starts to branch out before that point, the measurement shall be taken at the point where the branching begins.

2. A multi-trunked tree shall mean a tree having more than one trunk, two of which are three (3) inches or greater in diameter, protruding above grade from a single root ball and being separated by any portion of each. Multi-trunk trees shall be measured by the following method:

- a. Square the diameter of each trunk
- b. Add the squared diameters of all the trunks together
- c. Take the square root of the total above to give you the working diameter for that tree

Measurements shall be taken prior to any pruning or branch removal operations and must take into account the entire base of the tree.

C. How is the height measured for a cactus?

A cactus is measured from the base at grade to the highest vertical point of the plant. The height of all arms is also included in the total. Ocotillo and Yucca are also measured in this way, except that the flower stalk of the Yucca is not included.

D. What is meant by tagging native plants?

Tagging native plants is the means by which each protected plant is identified and its salvage status is noted as follows:

1. A number is to be assigned to each specific plant. This number will identify that plant throughout the course of the project.
2. The number assigned to a given plant shall be visible on the plant or plant container at all times.
3. The salvage status of each plant shall be noted by the use of the following color code system
 - a. Plants to be destroyed shall be tagged with blue survey tape
 - b. Plants to be salvaged and relocated shall be tagged with red survey tape
 - c. Plants to remain in place shall be tagged with white survey tape

E. What should be inventoried and tagged?

The Native Plant Inventory is to include all plants of the types and sizes listed in Section 7-401.B.5 of the guidelines and Section 46-105 of the Scottsdale Revised Code (botanical name governing). The areas to be inventoried are as follows:

1. Everything within the designated construction boundaries, to include any areas required for access to the construction site – vehicular access, utility access easements, etc.
2. Everything within a fifty (50) foot buffer area parallel to the boundaries of the actual construction boundaries, up to the property lines.
3. Any other areas which are determined by City staff and the applicant to be of concern.

F. What can be done to the protected plants prior to obtaining a Native Plant permit?

No disturbance of any protected plants may occur prior to being issued your native plant permit. For prior approval of pruning, you may contact the Planning Inspector for the project at (480) 312-5750. Excessive pruning may be deemed mutilation as defined in Section 7-401-B.5 of these guidelines and Section 46-105 of the Scottsdale Revised Code.

G. Can I just destroy the protected plants and replace them with more and better materials?

For plant materials which have been determined by an approved salvage contractor to be salvageable, the answer is no. If a large number of the plant materials on a site are determined to be unsalvageable, a replacement program may be submitted as part of the Native Plant Program. The intent of a replacement program should be to provide a variety of plant types and sizes to match what exists in the surrounding desert community. The quantity of trees to be used in the replacement program shall be determined by City staff and the applicant, and will be based on the total number of trees and the total caliper inches being destroyed in relationship to what would be salvaged under normal conditions.

H. What is a field walk and how do I arrange one?

The field walk is performed by City staff. Its purpose is to verify the accuracy of the Native Plant Inventory; to check the actual location of plant material in the field; and to check their physical relationship to the construction limits to determine any additional plants that may remain in place. The field walk is typically set up within two weeks from the time of receiving a complete submittal

from Development Services. The applicant or a representative need not be present, but if you wish to be, you can contact the City's Project Review Department at (480) 312-7080.

- I. Why do I have to indicate the location of a nursery site, and what is that inspection for?

The nursery site is identified to assure as little disturbance to the site as possible. The inspection of the nursery site is to verify the results of the Native Plant Program and should be done when all the plants being relocated have been placed in the nursery; on larger projects, this may be completed in phases. Inspections can be arranged with the individual inspector from the Inspection Services Department assigned to your project. Their number will be listed on the permit.

- J. Why must a salvage contractor be approved by the City?

Standard methods for relocating plants have needed to be adjusted and fine tuned to work with the native plants of the Sonoran Desert. It has only been within the past two decades that methods have been developed which yield reasonable salvage rates on native trees. For this reason, the City has required that salvage contractors submit their methodologies for review and approval. New technology and refinements can be submitted for review and used on a trial basis until shown to be as effective or superior to the existing methods.

- K. How does someone get on the City's list of approved salvage contractors?

To become listed as an approved salvage contractor with the City of Scottsdale, a person or company must submit a methodology outlining step-by-step procedures used to relocate and maintain protected native plant materials. This may be submitted to the City Manager's designee within the Project Review Division of the Community Development Department for review and approval. Prior to approval of a methodology, the salvage contractor must present a valid City of Scottsdale Privilege Tax License number. You may receive information on obtaining a Privilege Tax License number by calling (480) 312-2400.

- L. Who can prepare a Native Plant Inventory?

Anyone who has been approved as a salvage contractor may prepare a Native Plant Inventory. Any inventory work that is done by an individual or company that is different from the company that is doing the salvage work must also include a formal letter from the approved salvage contractor stating their acceptance of the plant inventory. Changes to an approved native plant

program will not be accepted by the Planning Inspector and will be returned to Project Review for re-approval.

M. What about salvaging the plants that are not protected by the Native Plant Ordinance?

The City of Scottsdale strongly encourages the salvage and reuse of plants that are not on the protected list. Although this effort is voluntary, the city publishes a list of groups and companies who are interested in salvaging small, unprotected plants either for reuse on the same site or for purchase for use in other landscape or restoration projects. In most cases, the salvage of existing plant material is more cost effective and achieves a natural appearance in a shorter period of time.

NATIVE PLANT NARRATIVE & APPLICATION FORM

| |
|----------------------|
| Office Use Only |
| _____ NP _____ |
| Submittal Date _____ |
| Project # _____ |

Project Name _____

◆ Property Address _____

Owner Name, Address & Phone # _____

Proposed Salvage Contractor, Cacti Salvage Contractor, & Tax License # _____

◆ Quarter Section # _____ - _____

Number of protected plants to be relocated: _____

Number of protected plants to be destroyed: _____

Total number of protected plants affected: _____

Please give a brief description below of your project including estimated timing of relocation, DR or PP case number, plant nursery location, and any other relevant information:

Native Plant Permit approval is dependent upon an approved final plat or DR case number

List approval date - ☐ Preliminary Plat _____ ☐ Development Review _____

Your City of Scottsdale Project Coordinator is: _____

Please attach this sheet to your plant inventory, site plan indicating proposed improvements, plant nursery location, N.A.O.S. protection plan, letter of authorization identifying a city approved salvage contractor, and copy of AZ Dept of Agriculture's Notice of Intent to Clear Land form for a complete native plant submittal.

Return to Development Services 'One Stop Shop' for review and approval. Only complete submittals will be accepted over the counter. Do not attempt to move any plant materials prior to being issued your Native Plant Permit.

Review time will be approximately two (2) weeks from time of notice that plants have been tagged.

◆ This information is available at the City of Scottsdale Records Division - 312-2356

Figure 7.4-1



City of Scottsdale Standards for Saguaro Salvage and Transplantation

1. Dig around saguaro leaving a minimum of two (2) feet of root out from the base and deep enough to allow for removal of a reasonable portion of the root ball.
2. Prune any shredded or damaged roots and dust with sulfur and streptomycin.
3. Planting hole should have one foot of loose native soil and be large enough to accommodate the larger lateral roots.
4. Saguaro should be re-planted at the same depth or no more than 6" deeper than its original position.
5. Mark original north orientation so saguaro may be re-planted in the same direction to reduce risk of sunburn.
6. Pack thoroughly using a mixture of native soil and sandy soil to promote root growth and better drainage.
7. After transplant, allow 2-3 weeks for damaged roots to heal before first water.
8. Water every two weeks during the first year and once a month during the second year after transplant by drip irrigation. If planted alone or within a nursery, place 4-1 gallon per hour emitters evenly spaced 2 to 3 feet from base and allow water to run for 8-15 hours per session.
9. If planted as a final location within landscaped areas, planting saguaro at least four (4) feet from small shrubs or a tree is ideal.
10. If a moat system is approved by City of Scottsdale Planning Inspection, a circular swale should be dug that is approximately one foot wide by 4" to 6" deep at center at a distance three to four feet out from the saguaro trunk. Water slowly and thoroughly twice a month for no less than two years.
11. Developer shall ensure that maintenance shall be provided for a minimum of two years from the time of placement at its final location.
12. Saguaro is established once it responds to rainfall by expanding.
13. Variations from the above process shall require approval from a City Planning Inspector.

Figure 7.4-2



Native Plant Tracking Form

City of Scottsdale Sustainability Indicators Project Data

| | |
|---|--|
| To be completed by salvage contractor: _____ | |
| Project: _____ | |
| Native Plant Case Number: _____ DR or PP Number: _____ | |
| Plan Check Number : _____ | |
| Address: _____ | |
| Native Plant Permit Number: _____ | |
| Number of protected plants on site Total: _____ | Number of protected plants destroyed Total: _____ |
| Number of protected plants actually attempted for salvage Trees: _____ Cacti: _____ Total: _____ | |
| Number of protected plants successfully surviving salvage after 3 months or prior to transplant Trees: _____ Cacti: _____ Total: _____ | |
| Date of completion: _____ | |
| * The contractor must also provide a listing of plant tag numbers that have survived salvage operation | |

- **Please complete and submit to City of Scottsdale Planning Inspection at or before three months after the completion of salvage. This information will serve as the City's requirement for total number of plants surviving salvage and will be required for all projects prior to issuance of a Certificate of Occupancy.**
- **Contractor must notify the City Planning Inspector 24 hours in advance of when inventories of survived plants will be performed.**
- **No native plants will be removed from the site prior to notifying the City Planning Inspector.**

Completed forms may be mailed or hand delivered to the Planning Inspector in care of Inspection Services, 9191 E. San Salvador, Scottsdale, AZ 85258. Forms may also be faxed to 312-5704. For more information, please contact 312-5750.

Figure 7.4-3

Section 7.5

PARK FACILITIES DESIGN STANDARDS AND POLICIES REVISED DECEMBER 1999

CHAPTER 7 LANDSCAPING

SECTION 7.5

PARK FACILITIES

PAGE INDEX

| SECTION | PARAGRAPH TITLE | PAGE |
|---------|--|------|
| 7-501 | Introduction | 1 |
| 7-502 | Definitions A. Neighborhood Park B. Community Park C. Specialty and Regional Park | 1 |
| 7-503 | Location Standards A. The General Plan B. Parks Master Plan | 2 |
| 7-504 | Park Master Plan Development Process A. Master Plan Approval Process Steps | 2 |
| 7-505 | Park Design A. Development Review B. Park Development C. Sidewalks D. Playgrounds E. Softball/Baseball Fields F. Court Facilities G. Irrigation H. Landscaping I. Construction Material J. Signage K. Parking | 3 |

FIGURE LIST

| FIGURE | DESCRIPTION |
|--------|--|
| 7.5-1 | New Building Standards |
| 7.5-2 | Custodial Room – Space and Equipment Standards |



SECTION 7.5 PARK FACILITIES

7-501 INTRODUCTION

The Park Design Standards & Policies have been established to assure that Scottsdale's Park and Recreation facilities provide quality and safe experiences for its citizen's. These standards and policies are not intended to provide specific design criteria, but to serve as a guide during the design phase. The design review of each park will be done on an individual basis.

7-502 DEFINITIONS

- A. Neighborhood Park: Provides primary park services and facilities which are easily accessible and available to local residents. Not intended for large group use. Typically between seven and 20 acres and serving from one block up to an entire neighborhood. Neighborhood parks are preferably located adjacent to elementary schools, neighborhood centers, or within a 15 minute walking distance of households in the service area.
- B. Community Park: Provides a full range of centralized recreational activities for major portions of the City with capabilities of accommodating large group reservations. Generally feature a community center building designed to meet multi-generational recreation needs. Typically between twenty and 80 acres, serving several neighborhoods or approximately 10,000 to 25,000 people. Community parks are preferably located in the center of several neighborhoods, adjacent to a middle school or high school where possible.
- C. Specialty and Regional Park: Provides specialized facilities and preserves significant unique features of the community, including environmentally sensitive areas. The size of these parks will vary as well as the specific number of people served by these parks; however, the parks should be oriented to serve the entire community and beyond. Location of park will vary depending on the dynamics of the park (e.g. park theme or mountain park).

7-503 LOCATION STANDARDS

A. The General Plan

The Public Facility Element of the General Plan for Scottsdale provides the basis for identification of the locations for the parks. A copy of the Public Facility Element is available at the One Stop Shop, 7447 E. Indian School Road, Suite 100, 312-2500.

B. Parks Master Plan – Vision 2020

The Parks Master Plan establishes park policy, delineates future park needs by acreage and facilities, and locates parks based on demographics. The Master Plan specifies standards to guide park development in Scottsdale. A copy of the Parks Master Plan can be obtained from the Community Maintenance & Recreation Division, Pepperwood Building, 7340 Scottsdale Mall, 312-2722.

7-504 PARK MASTER PLAN DEVELOPMENT PROCESS

A Master Plan is developed for each park. The Public Facility Element of the General Plan, in conjunction with the Community Maintenance & Recreation Division's Parks Master Plan – Vision 2020, help to guide the planning of facilities in each park.

A. Master Plan Approval Process Steps

1. Planning Consultant/Parks & Recreation Team

- Prepare alternative development concepts
- Conduct public input meetings with neighborhood and community
- Develop Preliminary Master Development Plan for presentation

2. Parks & Recreation Commission

- Conduct Public Hearing to review and recommend on Preliminary Park Master Plan

3. Planning Consultant/Parks & Recreation Team

- Prepares Final Park Master Plan from Parks & Recreation Commission recommendation
- Makes application for Municipal Use Permit to Planning Commission

4. Parks & Recreation Commission

- Reviews and recommends to the Planning Commission and the City Council for approval of the Final Park Master Plan

5. Planning Commission

- Reviews and recommends to City Council for approval of the Municipal Use Permit based on recommended Final Park Master Plan

6. City Council

- Review and approval of Final Park Master Plan and Municipal Use Permit
7. Approved Park Master Plan
- End of formal public review and involvement

7-505 PARK DESIGN

A. Development Review

1. Park design must be approved by the Development Review before any development occurs on the park site.

B. Park Development

1. Park land ratio shall consist of open space (25%), passive space (25%) and facility space (50%).
2. Whenever possible, parks shall be located adjacent to school sites to create a fluid joint use between the park and school facilities.

C. Sidewalks

1. Designated multi-use paths shall be a minimum of twelve (12) feet in width. See Sections 3.4 & 7.3 of this manual for bike paths and multi-use paths.
2. Sidewalks utilized specifically for pedestrians shall be a minimum of eight (8) feet in width.
3. All multi-use paths shall be located a safe distance away from active courts or fields.
4. Concrete shall be M.A.G. "A" spec, 5" slump 3,000 psi, 6" deep or 4" deep with 6" turndowns.

D. Playgrounds

1. Playgrounds shall meet or exceed all current U.S. Consumer Products Safety Commission (CPSC), American Society of Test/Masurement (ASTM), American Disability Act (ADA) and International Play Equipment Manufacturers Association (IPEMA) standards.
2. Upon completion/installation of new playground equipment, the installation shall be inspected by a third party National Playground Safety Inspector (NPSI).
3. Playground equipment/play opportunities shall be available for pre-school children (2-5 years old) and school-age children (5-12 years old).
4. Chilled drinking fountain(s) shall be installed in close proximity to the playground, but preferably not closer than 25 feet due to the problems encountered with sand. Drinking fountains shall meet ADA guidelines by having a wheelchair accessible fountain installed at 34" AFF, (measured to the deck), and a standard height

drinking fountain installed at 40" AFF. In addition, a child height drinking fountain shall be installed at 28" AFF. Drinking fountains shall not be constructed of ferrous metals whether protected by galvanization, paint or otherwise. Drinking fountains within 100 feet of playgrounds shall have assessable sand traps installed on the drains. It would be more desirable to install the drinking fountains on a building than installing free standing units. Chillers shall be located within 24" of the drinking fountains, no recirculating pumps shall be allowed. Water piping serving drinking fountains shall be copper. Chilled water tubing shall be insulated.

5. Playgrounds shall have water features for the purpose of providing water for sand castles, etc. and shall be constructed of non-ferrous metals and/or ultra violet resistant plastic. The design shall meet all playground safety standards. Water shall be provided via type L copper tubing and shall be separately valved. Faucets on the water posts shall meet ADAG for push pressure and be self-closing.
6. Public telephone(s) shall be installed in close proximity to the playground.
7. Metal playground slides are unacceptable.
8. Appropriate transfer stations, resilient materials will be installed to meet ADA access standards to playground equipment.
9. Playground surface, safety zones shall consist of a double washed premium sand, at a minimum depth of 12 inches.
10. There shall be some type of shade protection either from adjacent ramadas, (16 ft x 16 ft minimum) and/or non deciduous trees on the perimeter of the playground (30 inch box).

E. Softball/Baseball Fields

1. All fields shall be lighted to meet all current Illuminating Engineering Society (I.E.S.) standards and utilize effective shielding systems to reduce spill light off play areas.
2. Infields shall be constructed with an approved non-toxic organic binder, red color mix material especially prepared for ballfields. Material shall be a minimum of four (4) inches in compacted depth. Bind by crushed aggregate screenings down to ¼" or 3/8" fine particles.
3. Home plate and mounds shall be filled with a minimum of two (2) inches of fine grey brick clay incorporated at a uniform rate with established infield red mix. Infields and outfield turf areas shall consist of a Tif Hybrid Bermuda Grass.
4. Chilled drinking fountain(s) shall be installed in close proximity to the playground, but preferably not closer than 25 feet due to the problems encountered with sand. Drinking fountains shall meet ADA guidelines by having a wheelchair accessible fountain installed at 34" AFF, (measured to the deck), and a standard height drinking fountain installed at 40" AFF. In addition, a child height drinking fountain shall be installed at 28" AFF. Drinking fountains shall not be constructed of ferrous metals whether protected by galvanization, paint or otherwise. Drinking fountains within 100 feet of playgrounds shall have assessable sand traps installed on the drains. It would be more desirable to install the drinking fountains on a building

than installing free standing units. Chillers shall be located within 24" of the drinking fountains, no recirculating pumps shall be allowed. Water piping serving drinking fountains shall be copper. Chilled water tubing shall be insulated.

F. Court Facilities

1. All court facilities shall be lighted to meet all current Illuminating Engineering Society (I.E.S.) standards. Tennis courts should also meet United States Tennis Association (U.S.T.A.) standards.
2. All tennis courts should meet U.S.T.A. standards. Concrete courts should be considered due to extended life in a desert environment.
3. Sand Volleyball courts shall consist of Double Washed Mortar Premium Grade at a depth of twelve (12) inches.
4. Chilled drinking fountain(s) shall be installed in close proximity to the playground, but preferably not closer than 25 feet due to the problems encountered with sand. Drinking fountains shall meet ADA guidelines by having a wheelchair accessible fountain installed at 34" AFF, (measured to the deck), and a standard height drinking fountain installed at 40" AFF. In addition, a child height drinking fountain shall be installed at 28" AFF. Drinking fountains shall not be constructed of ferrous metals whether protected by galvanization, paint or otherwise. Drinking fountains within 100 feet of playgrounds shall have assessable sand traps installed on the drains. It would be more desirable to install the drinking fountains on a building than installing free standing units. Chillers shall be located within 24" of the drinking fountains, no recirculating pumps shall be allowed. Water piping serving drinking fountains shall be copper. Chilled water tubing shall be insulated.
5. Water for wetting courts shall be provided in the net standards with a Hunter series head in each standard. The source of water will be domestic and not from the irrigation system. All water piping shall be type L copper. The water shall be controlled by a system timer that allows for watering times up to 15 minutes and locks out the controls for a minimum of 30 minutes between activations. Activation shall be by a 24 volt momentary contact switch mounted on a net standard or other pole.

G. Irrigation

1. Systems shall be capable of interfacing with existing Motorola Irrinet computerized central system.
2. Irrigation guidelines, except as noted below, shall comply with Section 7-104, Median Landscaping, of this Manual.
 - Irrigation pipe 2" in diameter or larger shall be Class 200.
 - All gate valves shall be AWWA C-509.
 - All irrigation boxes shall be set at grade and supported by blocks to prevent crushing by traffic.
3. See Figure 7.1-5 of this manual.

H. Landscaping

1. Plant material shall consist of low water use, drought tolerant species. Plant material shall be approved by Community Maintenance & Recreation Division staff prior to installation. See Figure 7.1-6 of this manual.

I. Construction Material

1. Park fixtures and ramadas shall consist of steel, metal, aluminum or recycled material or approved equal, wood will not be permitted. Roofing material needs to be 20 year guaranteed metal, standing seam with Kynar finish.
2. Headers consisting of concrete, brick, ultraviolet treated vinyl or metal shall be installed between turf and landscaped areas.
3. All drinking fountains installed in parks shall meet ADA guidelines by having a wheelchair accessible fountain installed at 34" AFF, (measured to the deck), and a standard height drinking fountain installed at 40" AFF. In addition, a child height drinking fountain shall be installed at 28" AFF in locations where small children may be present. Drinking fountains shall not be constructed of ferrous metals whether protected by galvanization, paint or otherwise. Drinking fountains within 100 feet of playgrounds shall have assessable sand traps installed on the drains. It would be more desirable to install the drinking fountains on a building than installing free standing units. Chillers shall be located within 24" of the drinking fountains, no recirculating pumps shall be allowed. Water piping serving drinking fountains shall be copper. Chilled water tubing shall be insulated.
4. See Figure 7.5-1, New Building Standards, in this Manual

J. Signage

1. The standard park sign will be located at the main entrance of every neighborhood and community park. The park sign mold can be obtained from the City of Scottsdale Community Maintenance & Recreation Division.
2. Specialty parks may deviate from standard park signage with the approval from the Community Maintenance & Recreation Division. A marquee meeting the City's Sign Ordinance may be acceptable upon the approval of Community Maintenance & Recreation Division and obtaining a City sign permit.
3. All signage must meet the City of Scottsdale's Sign Ordinance. Ordinance information can be obtained at the One Stop Shop, 7447 E. Indian School Road, Suite 100, 312-2500.

K. Parking

1. All parking shall meet ADA Guidelines and the City of Scottsdale's parking requirements stipulated in the Parks Master Plan and City zoning requirements.
2. Parking lots lights shall meet all current Illuminating Engineering Society (I.E.S.) standards.

3. Non-deciduous trees (24 inch boxes minimum) shall be planted adjacent to parking lots to provide shading. An acceptable ratio is one tree per every five parking stalls.

FIGURE 7.5-1

GENERAL COMMENTS

This section deals with facilities constructed for the City of Scottsdale. These facilities for the most part serve to conduct the City's business or for the use of the citizenry. The reason for this section is to assure that the City constructs facilities that perform as expected, are able to be maintained at reasonable cost and use components and systems that are based on life cycle costs among other criteria.

It is understood that a building may be constructed using thousands of items. We will only highlight a relatively few in this guide.

Facilities Management will expect new construction documents to call for the use of these items or types of systems.

FACILITY TYPES

General Use Buildings:

- Office Buildings
- Libraries
- Recreation Centers
- Solid Waste Transfer Stations
- Water Reclamation Plants
- Maintenance & Warehouse Buildings

Vandal Resistant Facilities:

- Park Restroom Facilities
- Public Transit Facilities
- Park Ramadas
- Parking Lot Shade Structures

Miscellaneous Structures:

- Bike Path Tunnels
- Bike Path Drinking Fountains
- Bike Path Lighting and Controls

FACILITIES MANAGEMENT NEW BUILDING STANDARDS GENERAL USE BUILDINGS

PLUMBING

PIPING

DRAINS:

- Cast iron soil pipe.
- ABS DWV pipe when permissible by code.

VENTS:

- Cast iron soil pipe.
- ABS DWV pipe when permissible by code.
- Vandal resistant vent caps to be installed at vandal resistant facilities.

SEWER:

- ABS DWV schedule 40 pipe.
- PVC SDR pipe 6" and above.
- Yard clean out to have threaded cap below cast iron sewer traffic cover with concrete apron. 12" x 12" square.
- Clean outs to be located every 90 feet. Horizontal length.
- Clean outs in concrete shall have nickel bronze covers.

DOMESTIC WATER:

- Type "L" hard drawn copper above ground.
- Type "L" soft drawn or hard drawn below ground outside of buildings.
- Type "K" soft drawn below ground under buildings (only where necessary).
- Yard piping - Type "L" copper. 1-1/2" and larger shall be silver soldered. PVC is not permissible.
- Pressure regulator required on all City of Scottsdale buildings. Watts U5B
- All branch lines to be valved when possible.
- Valves to be full port ball valves through 2". 2-1/2" and larger to be butterfly valves with worm gear operator.
- Underground valves up to 2" shall be brass with rectangular operating stem.

SOLDER:

- To be lead free.
- Flux to be non-acid and joints to be wiped clean.

FIXTURES

WATER CLOSETS:

- Top spud, wall mount, siphon jet, elongated bowl with flushometer valve and white solid plastic seat.
- When tank types are required for reduced water piping size, they should be of the "Flushmate" flushometer design, 1.6 GPM. Eljer tank type is not permissible.
- Closets to be hung on approved carriers.

URINALS:

- Wall hung, top spud, blow out type.

LAVATORIES:

- Counter top lavatories shall be enameled cast iron with stainless steel rim or Bradley Terreon solid surface material.

- Wall hung lavatories shall be enameled cast iron with Eljer Bucknell #052-0197 or equal lugs for exposed arm carrier.

SINKS:

- Minimum 18 gauge stainless steel, Eljer ADA, kitchen sinks to be four hole with fourth hole plugged if not used initially. Brass body basket strainer Dearborn #16 or equal.
- Mop sinks - Floor type Fiat #2424. Faucet to be Chicago #897 with integral stops, vacuum breaker and wall support. Provide splash shields on walls adjoining mop sink.

DRINKING FOUNTAINS:

- Drinking fountains should be wall hung stainless steel, or solid surface material.
- Fountains should have rounded edges.
- Bubbler heads shall be metal - no plastic or rubber parts.
- Must have adjustable stream height regulator.
- Epoxy coated steel drinking fountains are not acceptable. Please submit for approval.
- Fountains with non-approved materials, i.e., lead aluminum, steel in contact with water are not acceptable, including aluminum drain parts. Please submit for approval.
- Chillers to have HF134a refrigerant.
- All City of Scottsdale drinking fountains should be chilled and at least one at each location wheelchair accessible. ADAG requires min. 2 fountains @ each location. Second fountain to be mounted @ 40" AFT. If site is where children may gather, i.e., parks, libraries, etc., a third fountain should be mounted at 28" above finished floor.
- Remote chillers shall be located within 3 feet of drinking fountains.
- Outdoor fountains to have remote chillers.

FAUCETS:

- Lavatory--Faucets to be single handle of cartridge design Moen #8470.
- Kitchen--single handle cartridge type (prefer Moen #7300).
- Bar sink--single handle cartridge type (prefer Moen #4901).
- Mop sink--chrome plated, wall mount, with integral stops, vacuum breaker and hose threads (prefer Chicago #897).
- Showers--pressure balanced with integral stops (prefer Moen #8350).
- Wall hydrants to be Acorn 8000 series or Woodford Model B24.
- Hose bibbs to be Woodford 24P - 3/4".

TRIM:

- Exposed traps to be 17 gauge with clean out and chrome plated brass slip joint nuts.
- All exposed tubular to be 17 gauge. All slip joint nuts to be brass.
- Extensions of exposed tubular shall be made with solder joint extensions.
- Angle stops to be Aqua-flo EZ turn ball valves #V-101-A.
- Concealed traps and tubular may be constructed of ABS or PVC.
- Supply tubes to be chrome plated nose formed type. Corrugated tube is not acceptable.
- Clean out covers and screws shall be stainless steel or chrome plated bronze with stainless steel screws.
- Disposer to be commercial grade 3/4 h.p. - Ise 333ss Pro.
- ADA trap covers to be Trubro.

PUMPS:

- Circulating pumps shall be magnetic drive close coupled pumps. Prefer Grundfos 42-18 SU, with thermo switch.

- Storm water sump pumps shall have separate receiving basin to catch solids. Prefer Myers vortex type pump.
- Sewage ejectors shall be submersible Vortex type, packaged duplex systems with fiberglass tank, mercury float switches, check valves and controls by same manufacturer. Prefer Myers, Tornado series.

TRAP PRIMERS:

- Should be of type that is piped off of water closet flush valve (concealed type that operate on drop in pressure rarely work). Prefer Sloan #F-72-A1.
- Trap primers not located near a flush valve shall be operated by electric timer.

FLOOR DRAINS:

- Floor drains shall have nickel bronze grate with standard screws (no vandal resistant screws).
- Floor drains to have removable sediment bucket in vandal resistant areas where debris may accumulate.

ALL BACKFLOW PREVENTORS:

- To have bronze strainers installed upstream.
- Install 1/4" flare fittings with flare caps in all test cocks.
- Install per City of Scottsdale standard detail.
- Provide insulated cover on outdoor free standing backflow preventors, hot box or equal.

ON HVAC SYSTEMS:

- Where a single backflow preventor feeds 2 or more areas such as a cooling tower and a chilled water loop, dual checks with unions shall be installed on each to prevent water from one area flowing to another area. Prefer Watts #7, suffix U or equal. See drawing attached.

ALL FIRE SYSTEMS:

- Require a double check valve in accordance with City of Scottsdale's Backflow Ordinance #2346, unless entire system is of potable piping and fittings.

TELEPHONE AND EMERGENCY EQUIPMENT:

- Requiring cooling 24 hours a day, have separate independent back-up cooling units, under energy management control.

DOORS AND HARDWARE - EXTERIOR

STANDARD SWING TYPE: (Hollow metal)

- Door and frame with Roton hinge.
- Surface mounted closer - L.C.N. 4040.
- Use commercial heavy duty locksets with all metal structural and operating parts. They must accept the City's "Best" removable core keying system with 626 finish.

STANDARD SWING TYPE: (Aluminum frame with glass)

- Medium style.
- 10" bottom rail.
- Welded inner joints.
- Closer, surface mounted - suggest L.C.N. 4040.
- Lockset to accept the City's BEST removable core system, and to have all metal internal parts.

- Hinge - center hung, overhead concealed pivot.
- Panic bar, surface mounted only. (Von Duprin or equal)
- Opening size to meet ADA.
- Thresholds, weather seals, kick and push plates, door stops and wall bumpers to be included as standard equipment.

AUTOMATIC DOORS:

- Swing type door - Dor-O-Matic Astro swing or equal.
- Slider/Bypass - Dor-O-Matic Astroslide or equal.
- Sensor type - Door-O-Matic Astro-Scan or equal - no floor pads.
- Commercial lockset with "Best" removable core with 626 finish.
- Keying to match the City's "Best" system with 626 finish.
- If building has emergency generator, automatic doors should be on generator back-up.

OVERHEAD DOORS:

- Motor and hand chain operated with a keyed switch for exterior access.
- Coiling – Commercial duty.
- Sectional - commercial duty.
- Operator type - electric.

SECURITY FOR LIMITED ACCESS:

- Key pads to be compatible with the City's Hirsch system.
- Sequencers for the master key are to be provided in all new buildings.
- Locks/keys must match the City's Best removable core system.

AUTOMATIC TRAFFIC CONTROL ROLLING GATES:

- Power operator shall utilize electric motor and hydraulic drive.
- The gate shall utilize V-groove steel wheels that follow an inverted angle iron track set in a concrete footing.
- Keypad to control access must be compatible with the City's "Hirsch" system.

BATH PARTITIONS:

- Bath partitions to be solid plastic. Santana, Light Blue or equal in office buildings.
- Handicapped accessible per current code.

RESTROOM ACCESSORIES:

- JRT Junior Toilet Paper Dispensers for Parks; Scott #0956-4 stainless steel.
- Nice Touch plastic soap dispensers #380143; white; for office/nicer public facilities; Waxie Janitorial Supply.
- Sanitary napkin machines to be "Bobrick" model B-2800, surface mount or B-3500 recessed mount, with 25 cent coin mechanisms.
- Toilet seat covers without lock; surface mount; Bobrick #B-221; for areas not needing security; AZ Washrooms.

CEILING TILE:

- Lay in tile shall be 2' x 2' tegular edge Armstrong 704-A.

CITY OF SCOTTSDALE
HVAC & R SPECS

Part 1: General

The provisions of these standards regulate the design of the mechanical systems. Emphasis is to be placed on system efficiency, energy, and water conservation, economy of maintenance, and utility expense to minimize life-cycle costs.

It shall be the responsibility of the consulting engineer to secure all as-built drawings and to make field inspections, as required, and to obtain all information needed for the work.

- A. Provide (residential) (commercial) mechanical systems including:
 - (Heating) (Cooling) (heating and Cooling) system.
 - (Hot air duct) Hot water baseboard) Heat pump) system.
 - Fans, sheet metal work, registers, grilles and diffusers.
 - Piping distribution system and insulation.
 - Humidification systems.
 - Temperature controls.
 - Testing, adjusting and balancing.
- A. Modify, relocate and extend existing service to accommodate new work. Relocate existing components as required for new system.
- B. Coordinate with Owner's room uses to provide adequate system for all contract area.
- C. Coordinate location of mechanical systems to avoid interference with location of other systems, including piping and lighting fixtures.
- D. Do not cut structural elements without prior written approval.

Part 2: Submittals

- A. Submit for approval product data, operating and maintenance data, balancing reports and record documents.
- B. Submit signed and sealed shop drawings for review and as required for building permit.
- C. Prior to the completion of a project, at least 4 sets of maintenance manuals, operating manuals, parts manuals, as-built and shop drawings of all equipment covered in this section shall be submitted to the city, with one set specifically to the H.V.A.C. team.

Part 3: Quality Assurance

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use journeyman level installers with universal certification for proper refrigerant usage. Delivery, handle, and store materials in accordance with manufacturers instructions.
- B. Arrangement of systems indicated on the drawings is diagrammatic, and indicates the minimum requirements for mechanical work. Site conditions shall determine the actual arrangement of systems. Take field measurements before fabrication. Be responsible for accuracy of dimensions and layout. Overhead ductwork shall be laid out to obtain maximum head room.
- C. All installations shall be designed for total system energy efficiency and conservation. HVAC systems should be designed based on a life-cycle cost analysis. A comprehensive energy study shall be performed for all buildings 10,000 sq ft. or more, using computer simulation programs such as TRACE, DOE2, or others approved for use by the federal government. The computer simulation program shall be used to perform the energy analysis and evaluation of alternative building methods, materials, orientations, lighting and HVAC systems. A diversity factor will not be calculated into the sizing of HVAC equipment to eliminate the down sizing of the equipment.
- D. All systems shall be designed so that they are easily adaptable to the future growth of the facility.
- E. All design considerations shall comply with ASHRAE standards.
- F. Exterior design conditions:
 - Outdoor design temperatures shall be:
 - Summer-120 degree F Dry Bulb, 76 degree F Wet Bulb
 - Winter-34 degree F Dry Bulb
- G. Interior design condition:
 - Cooling-72 degrees F Dry Bulb
 - Heating-74 degrees F Dry Bulb
 - Evaporative cooling – 1 air change/2 minutes
- H. No equipment, piping, hangers, ducting, or electrical will be abandoned in place. All Unused equipment will be removed.

Part 4: Products/Materials

- A. Piping: Schedule 40 seamless black steel, ASTM A 53, Grade A;
- B. Type L copper pipe ASTM B 68 **No PVC at all.**
- C. Where a single backflow preventor feeds 2 or more areas such as a cooling tower and a chilled water loop, dual checks with unions shall be installed on each to prevent water from one area flowing to another area. Prefer Watts #7, suffix U or equal.

Part 5: Component Standards

In large systems (10 tons or more), utilize several small units.

In larger systems (100 tons or more), when a single unit is called for, utilize high efficiency, multiple-compressor, water-cooled chiller.

All equipment to be rated at Air Conditioning and Refrigeration Institute's (ARI) conditions.

- Unitary air conditioners and heat pumps should be selected based on SEER (units less than 5.4 tons) and EER (units over 5.4 tons) ratings. SEER rating should be a minimum of 13.0 and EER rating should be a minimum of 12.
- Chillers should utilize HFC refrigerants. Chillers should not exceed consumption of 0.56 kw/ton (100% full load in accordance with ARI standards).

- All electric motors exceeding 1,000 operating hours annually shall be energy efficient and shall have minimum acceptable nominal efficiency for single speed motors as specified below. Energy efficiency rating must be made using testing methodology IEEE-112, Test Method B.

| <u>HP</u> | <u>Min. Rated EFF (%)</u> |
|---------------|---------------------------|
| 1-4 | 84.0% |
| 5-9 | 89.5% |
| 10-19 | 91.5% |
| 20-49 | 92.8% |
| 50-99 | 94.1% |
| 100-124 | 94.5% |
| 125 & Greater | 95.0% |

Placement of Equipment

- To minimize safety hazards and to provide for ease of accessibility for maintenance and repair, major air conditioning and heating equipment components (compressors, air handlers, heaters, etc.), shall not be located in areas immediately above hard ceilings. If design suggests that major equipment be located in hard ceiling areas, approval of the HVAC team is required. In all cases, an adequate permanent work platform shall be provided for maintenance functions.
- Roof-mounted equipment must be curbed. Roof-mounted equipment shall not be located closer than six feet from roof edge. Safe access must be provided for all roof-mounted equipment.
- Equipment may not be placed in a space in such a manner that the maintenance, repair, removal of the equipment requires and alteration to the doorway, roof, ceiling, floor, wall or adjacent equipment.
- Multi-storied facilities shall be designated with a minimum of one air handler per floor.
- Central air distribution is to be accomplished by variable air volume systems with variable fan speed rather than constant volume systems for the same system static pressure. (This approach reduces energy use during part load conditions and takes advantage of each zone's operational characteristics).
- Consider economizer cycle (free cooling) by using "plate & frame" heat exchanger for systems with cooling tower capacity exceeding 100 tons and energy management and temperature control system (EMTCS) for automated valve control.
- Avoid multi-zoned packaged air conditioning units.
- Evaporative cooling shall be evaluated and installed where practical. Evaporative coolers shall utilize Celdek/Glasdek pad media, or approved equal, with a minimum thickness of 8 inches.

Air Distribution System

- Air shall be supplied to the occupied space by low-velocity ducts.
- To minimize air circulation fan horsepower, ductwork shall be designed for the lowest practical total pressure drop.

Small Buildings (Up to 25 tons)

- Packaged and split heat pump and a/c systems with a S.E.E.R. rating of 13.0 or higher with economizers.
- Gas fired furnace.

- All units to be ground mounted when possible.
- Sight glasses to be installed on all split systems.
- All units should have access from and be installed so they may be maintained without the use of ladders.

Medium Buildings (25-100 tons)

- Air cooled high efficiency package chiller units.
- Reciprocating or Scroll compressors.
- Gas fired boiler (heating) (Parker, Cleaver-Brooks or Unilux.)
- Fan powered V.A.V. boxes
- Four pipe system or Central air handling station with V.F.C. and hot water coil in fan powered V.A.V. box.
- All outdoor units to be ground mounted when possible.
- Sight glasses to be installed on all split systems.
- All units should have access from and be installed so they may be maintained without the use of ladders.

Large Building (100 tons and Up)

- High efficiency chiller
- Screw or Centrifugal compressor shall have open drive motors using V.F.D.
- Gas fired boiler (heating)
- Fan powered V.A.V. boxes
- Four pipe system or Central air handling station with V.F.D. and hot water coil in fan powered V.A.V. box
- System shall be capable of using 100% outside air or plate and frame heat exchanger for economizer operation.
- All units to have access from and be installed on the ground floor.
- Efficiency - .65KW per ton-ARI Certified in the form of an Integrated Part Load Value (IPLV).

Pumps:

- Shall be of the back pull-out design, end suction, close coupled base mounted.
- High EEF motors.
- Isolation valves in Discharge and Suction Line.

Cooling Towers;

- Non-sprinkled dual cell.
- Plastic fill and metering devices.
- Vertical discharge, propeller fan only.
- Motor out of the air stream.
- Tower shall incorporate a bypass system low ambient conditions.
- V.F.D. for periods of low load conditions

Water Treatment

- Indoor loop pot feed, engineered to size
- Outdoor open loop-solid state (Lakewood) P.H. and T.D.S. controller combination. L.M.I.
- Chemical pump and 55 gallon plastic drum

Energy Management Control System

- All buildings shall be D.D.C. micro processor capable of running in City's existing Robert Shaw software and computer.
- Robert Shaw version 11.4 as of 2/15/95.

- All buildings utilizing 50 tons or greater cooling systems will be wired to and controlled by a Siebe DMS 3500 front end with an ethernet card.

Part 5 - General:

- All installations shall conform to all national and local codes as adopted by the City of Scottsdale
- Provide "As Built" drawings on CD-Rom discs, Auto Cad format, and hard copy.
- All units shall have disconnects mounted within 6' of units.
- Disconnects to be Heavy Duty Blade type.
- All control wiring to be routed and installed into EMT conduit.
- All seal-tight conduit shall be metal core, with metal connectors
- Flex duct limited to 6', Foil backed
- Insulate condensate lines, condensate lines to be copper. Condensate lines shall have a union installed within 6" condensate outlet of the unit.
- No standing pilots
- Use standard size and type filters as defined by Eco Air C-35 or other local A/C filter manufacturer.
- 2" minimum thickness, pleated, filters only, with return air filter frame to ceiling mounted. Use filter grill type or equivalent and specified in submittal form.

Part 6 - Evap Coolers:

- Arvin Master Cool units are to used where evap coolers are to be installed.
- Clean Machine optional pump kits installed
- Evap cooler drains to be piped with minimum Type M cooper to floor sink or custodial sink
- Evap cooper feed to be minimum Type L cooper on roof mounted units
- There shall be a ball valve shut off at each unit.

Part 7 - Commercial Ice Machine:

- Manitowoc ice machines only
- Chillers to have HFC 134a refrigerant
- Remote mounted condensers on indoor applications
- No water cooled condensers

Part 8 - Exhaust Fans:

- All exhaust fans over 1/3 hp to be belt driven.
- All belt driven blowers to have grease zerk fittings.

Part 9 - HVAC Specs

1. Sight glasses on liquid lines of split DX systems.
2. Refrigerant piping shall be brazed using filler material meeting AWS A5.8
3. All control wiring will be run in E.M.T.
4. Split DX systems will have total refrigerant charge weighed and the number will be furnished to the H.V.A.C. crew.
5. Filter boxes shall not contain obstructions in filter tracks, screwhead, thread, rivet.
6. Only personnel with a universal certification for refrigerant recovery and handling are to be permitted to work on the refrigeration equipment for the city.
7. Have the abandoned in place materials removed before a job is started. All unused equipment related to the upgrade is to be removed.
8. After the service/install is completed contract shall "thoroughly clean area of debris that they caused."
9. 10% of funds are to be withheld by city until job is completed to satisfaction of City Inspector and H.V.A.C. crew.

10. Techs are to have universal certification in proper refrigerant handling procedures.